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COMPUTER POWER USER

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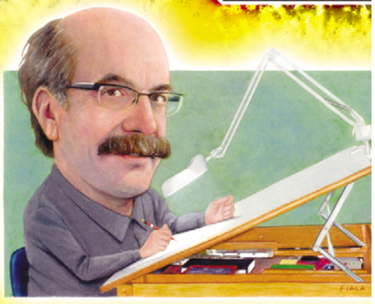

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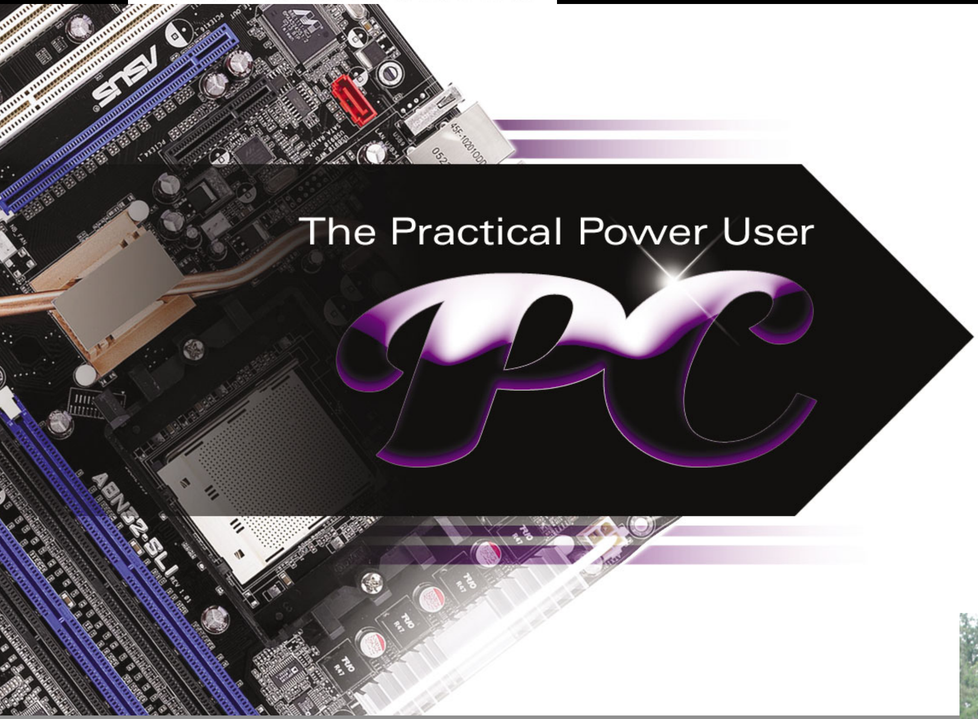

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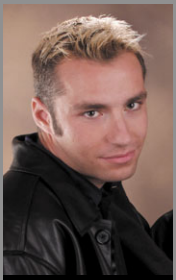

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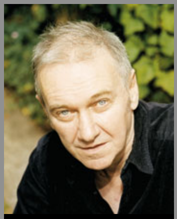

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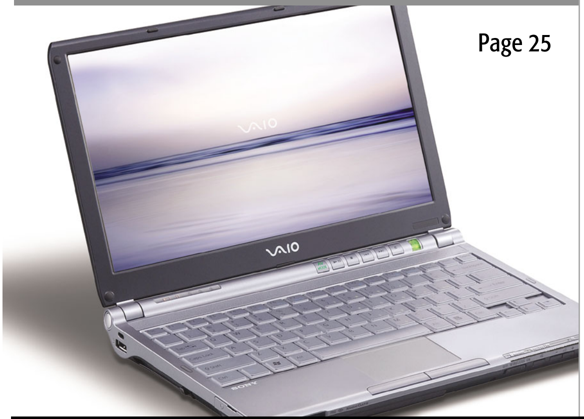

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EDITOR'S NOTE

It's not uncommon for us to review processors that cost around $1,000, nor is it unusual for us to review graphics cards that will set you back $500 or more. We know there are some folks out there who intend to get the best regardless of what it costs them, and even if you can't afford one now, you might be interested to know how a current high-end graphics card performs so that when you get a chance to get one a little cheaper down the road, you'll now what sort of performance you can expect to get from it.

Then, of course, there's the gee-whiz factor. It's why *Car & Driver* road-tests Ferraris and *Golf Digest* reviews $600 drivers, and we figure the same thing applies here: Even if a $600 graphics card is beyond your budget, you probably want to know about it because it's wicked cool.

That said, we recognize there are plenty of folks out there (like us, for instance) who crave fast, powerful PCs but don't have the jack to get the latest high-end graphics card, CPU, or motherboard when building a new PC. This issue is for you (and us).

We looked at several core components, including motherboards, CPUs, graphics cards, and memory, and sought out affordable parts in each category that the savvy user can make perform considerably higher than their rated specs would indicate. Starting on page 50, you'll see several articles that point out likely candidates you can use to build your next Practical Power User PC, as well as pointers on how to get them in fighting shape.

So take a look, then stop by our forums at www.computerpoweruser.com and let us know what you think.

Chris Trumble, Publication Editor, *CPU*

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Gotcha.
Here it is.

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Compiled by Steve Smith

Creative Web Cams Find Their Voice

With the rise of Skype, audio instant messaging, and Web conferencing, the poor voice rendering of many PC peripherals has become woefully apparent. Never missing a trend, Creative Labs launches a new line of Web cams that promise to get voice right. The flagship Live! Cam Voice ($169) uses dual-adaptive microphones to capture voices from multiple directions and minimize background echoes and feedback. The video side keeps up with 1.3MP resolution for video capture and enhanced low-light performance. You can use the Live! Cam Voice with Skype, and Creative rounds out the line with less-expensive models for video IM and notebook use. ▲

Special microphones and noise filtering promise to bring Web cam audio beyond the scratchy record era.

Shuttle Squeezes Core 2 Performance Down To Size

At about 8 inches high, Shuttle's barebones XPC SD37P2 can pack full-sized power and features around Intel's new Core 2 Duo chips.

Shuttle's XPC SD37P2 really impresses us with the features it promises to pack into an 8-inch-tall mini form factor. You can configure the barebones unit with either Core 2 Duo or Core 2 Extreme CPUs, but we love the idea of being able to pack two GPUs (ATI CrossFire-compatible) onto such a tiny PCI Express motherboard. Shuttle conceals all of this power with Silent X technology that combines smart fans with temperature-regulating software. Now you can pull into your next LAN party as the strong and silent type. ▲

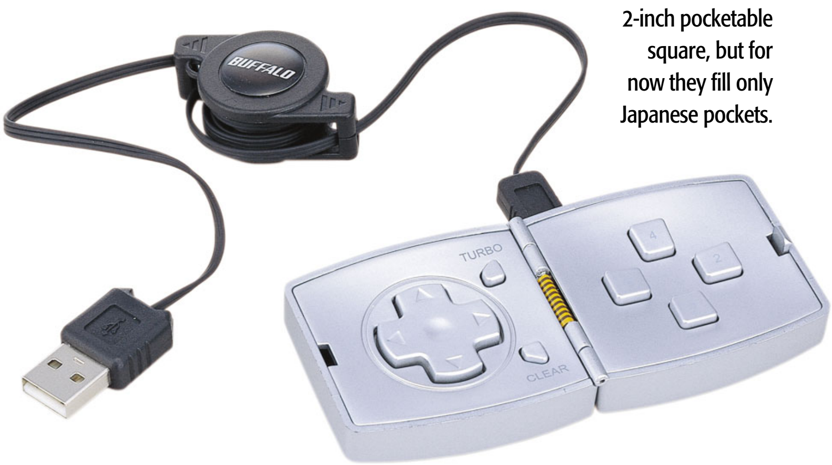
Microsoft & Razer Sink Their Teeth Into Mice

The Habu gaming mouse promises both 2,000dpi performance and removable side buttons for optimal hand fit.

The Habu is a small but poisonous southeast Asian snake, so we imagine Microsoft and Razer are hoping to take a bite out of Logitech's market dominance by joining forces and creating this latest example of an over-the-top gaming mouse. Sure, there's the 2,000dpi resolution for ultra-fine control, 16-bit data path for laser tracking at 1,000MHz, and rubberized grips and buttons are a given nowadays, but Habu one-ups everyone with removable side buttons that promise to fit the mouse to different hand sizes more accurately than ever before. The Habu should be available by the time you read this for $69.95. ▲

Buffalo's Incredible Shrinking Game Controllers

We've already started campaigning Buffalo to bring its too-cool USB Micro-Pads to the United States. Approximately 2 inches square when closed and 4 inches wide when opened, the Micro-Pads' case design puts action buttons on the right side and direction keys or an analog stick on the left. Four more buttons along the top edge can serve as shoulder controls. Even the USB cable is smartly designed, with a retractable spindle for better wire management. No word from Buffalo yet on pricing and availability in Japan, but if anyone is traveling from Asia and has a half an inch of suitcase space left for one of these things, we'll make it worth your while. ▲

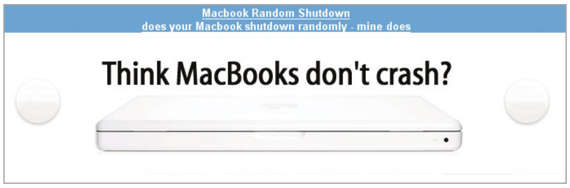


The Buffalo Micro-Pads fold down to a 2-inch pocketable square, but for now they fill only Japanese pockets.

Hardware Mole

I'm a PC. And I'm A M—

After months of crowing about its superior usability and reliability in all of those clever TV ads, it was only a matter of time before Apple got smacked back. More than 400 recent MacBook buyers complained at MacbookRandomShutdown.com that their notebooks just shut down without warning. Apple finally acknowledged the possibility of the problem in an online support note, but there's no official word on why this is happening and how often. ▲



Macbook Random Shutdown

does your Macbook shutdown randomly - mine does

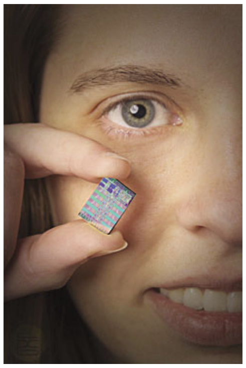
Think MacBooks don't crash?

Who is restarting now? Owners of new MacBooks are complaining about RSS (random shutdown syndrome).

But Can It Play Killzone?

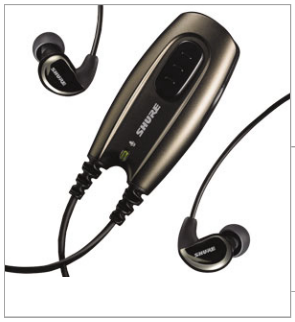
Although Sony appears to be having trouble filling the retail channel with its new PS3 game console, IBM already has its own plans for 16,000 of the Cell processors it co-developed to go into the PS3. The Roadrunner project hopes to combine Cell CPUs with AMD Opterons in a supercomputer capable of 1.6PFlops of processing power. That would be 1.6 trillion calculations per second and three times the speed of the current champion, IBM's own Blue Gene/L. Sure, impressive, but what does the controller look like? ▲

IBM may build the world's fastest supercomputer with the help of the Cell processors it co-developed with Sony.



Headbanging In Triplicate

Shure's latest incredibly priced earbuds try to separate you from $500 (yes, $500!) by promising three hi-def audio drivers. The one tweeter and two woofers (yes, two woofers!) are supposed to give unprecedented low-end detail in an in-ear design. Even more incredible than the price is the E500PTH's PTH (Push-To-Hear) feature that lets you switch between your music and external conversations; a VoicePort microphone pumps outside voices into the earbuds. $500 for good bass? Pricey. Never having to pop a bud from one ear and mutter, "Huh, whatyasay?" Priceless. ▲

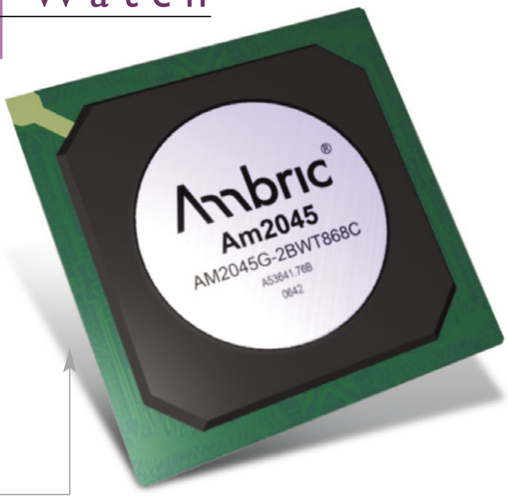


Shure's new E500PTH mini-cans put three speaker drivers a few millimeters from your eardrums.

Compiled by Dean Takahashi

Ambric Designs Massively Parallel Computing Fabric

Ambric hopes to make DSPs (digital signal processors) and field-programmable gate arrays obsolete with a new kind of computing fabric chip that will have a sea of processors onboard. Mike Butts, a fellow at Ambric, says that the low-powered chip, code-named Kestrel, will be ideal for processing multiple streams of HD video. The chip consists of 45 processing units called brics; each bric has eight CPUs with memory and interconnect. Operating at 333MHz, the chip can execute 1.08 trillion operations per second, or about 10 to 15 times the throughput of a DSP. Ambric expects to ship the chips next year. ▲



Carnegie Mellon Team Designs Speech Recognition Chips

The In Silico Vox Project team at Carnegie Mellon University says a custom chip design to implement high-quality speech recognition could improve performance and lower power consumption in speech recognition applications. Rob Rutenbar, a member of the research team, says that it makes sense to create special-purpose chips that are specifically tuned for speech recognition processing. Just as graphics chips moved from CPU-based solutions to custom graphics chips, Rutenbar says that moving speech recognition applications from software to chips would be less restricting. With very fast recognizers baked into silicon, the In Silico Vox team can improve speech recognition performance by 100 to 1,000 times. Also, the team is working on two different speech recognition chips that will depend on high memory bandwidth. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Athlon 64 FX-62	5/23/2006	$1,031**	$794	$764*
AMD Athlon 64 X2 Dual-Core 4200+ energy efficient	5/16/2006	$417**	$215**	$185
AMD Athlon 64 X2 Dual-Core 4200+ AM2 or 939	5/31/2005	$537**	$289	$209
AMD Athlon 64 X2 Dual-Core 4400+ energy efficient	5/16/2006	$514**	$514*	$487
AMD Athlon 64 X2 Dual-Core 4400+ AM2 or 939	5/31/2005	$581**	$249	$224
AMD Athlon 64 X2 Dual-Core 4600+ energy efficient	5/16/2006	$601**	$240**	$240
AMD Athlon 64 X2 Dual-Core 4800+ energy efficient	5/16/2006	$671**	$671*	$670
AMD Athlon 64 X2 Dual-Core 4800+	5/31/2005	$1,001**	$309	$286
AMD Athlon 64 X2 Dual-Core 5000+ AM2 only	5/23/2006	$696**	$359	$375
AMD Athlon 64 X2 Dual-Core 5200+ AM2 only	9/6/2006	$827**	N/A	$827**
Intel Pentium Processor Extreme Edition 965 3.73GHz dual-core	3/22/2006	$999**	$999**	$999**
Intel Pentium 4 650 3.4GHz 2MB cache 800MHz FSB 90nm	2/21/2005	$401**	$222	$266
Intel Pentium 4 651 3.4GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$273**	$180	$183
Intel Pentium 4 660 3.6GHz 2MB cache 800MHz FSB 90nm	2/21/2005	$605**	$205	$277
Intel Pentium 4 661 3.6GHz 2MB cache 800MHz FSB 65nm	12/27/2005	$401**	$205	$183
Intel Pentium 4 670 3.8GHz 2MB cache 800MHz FSB 90nm	5/26/2005	$849**	$630	$632
Intel Pentium D 840 3.2GHz dual-core 2MB cache 800MHz FSB 90nm	5/26/2005	$530**	$229	$327
Intel Pentium D 920 2.8GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$241**	$159	$159
Intel Pentium D 930 3GHz dual-core 2MB 800MHz FSB 65nm	12/27/2005	$316**	$179	$160
Intel Pentium D 960 3.6GHz dual-core 2MB 800MHz FSB 65nm	5/1/2006	$530**	$323	$339
Intel Core 2 Duo E6300 1.86GHz 2MB cache 1,066MHz FSB 65nm	7/27/2006	$183**	$183**	$184
Intel Core 2 Duo E6400 2.13GHz 2MB cache 1,066MHz FSB 65nm	7/27/2006	$224**	$224**	$224
Intel Core 2 Duo E6600 2.4GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$316**	$316**	$325
Intel Core 2 Duo E6700 2.66GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$530**	$530**	$539
Intel Core 2 Duo X6800 2.93GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	$999**	$999**	$998

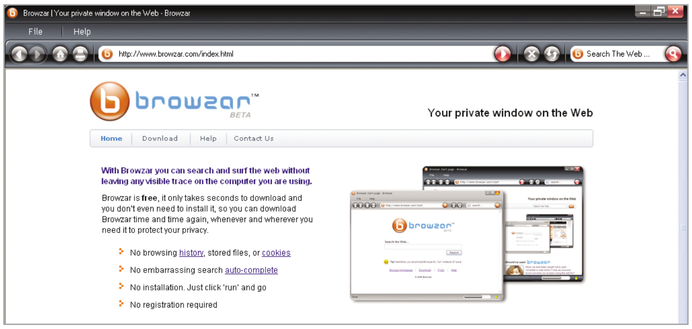
Intel CTO Looks To 64-Core Chip Future

Intel CTO Justin Rattner says he foresees a day when the company will put as many as 64 cores on a single microprocessor chip. But for applications to fully exploit these chips, Intel would need to improve their cache memory, bandwidth, and other features. Furthermore, these new chips would require hundreds of gigaflops of performance to work correctly. But once these improvements were made, multicore chips would be able to tackle huge problems such as recognizing the faces of terrorists in crowded airports or accurately reading the lips of people speaking in front of a camera. Rattner says he also foresees multicore chips performing tasks such as capturing the motion of an actor from four different camera angles and storing the synthesized picture as a 3D image. What's more, the industry will have to develop benchmarks to measure the performance of these multicore microprocessors. Dr. Kai Li, a professor of computer science at Princeton University, has volunteered to set up a repository for multicore benchmarks, says Rattner. ▲

Compiled by Blaine Flamig

Browzar:
"Your Private Window On The Web"

The next time you need a good scare, hop on a computer in a library or cyber café and sneak a peek at the browser History and cookies. Oh, the horror. Why some people equate public computers with debauchery, we're not sure. What we do know is that Browzar (www.browzar.com) can spare us all a lot of embarrassment. Ajaz Ahmed, the man responsible for the UK's Freeserve ISP, created Browzar, a tiny 264KB download that uses IE (5.5 and above) to let you surf without tracking any temporary files, cookies, or auto-complete information. The free browser is still in beta and doesn't require a registration to use. Only a Windows version is available now, but Linux and Mac versions are in the works. ▲


Browzar | Your private window on the Web - Browzar
File
Help
http://www.browzar.com/index.html
Search The Web ...
browzar™
BETA
Your private window on the Web
Home
Download
Help
Contact Us

With Browzar you can search and surf the web without leaving any visible trace on the computer you are using.

Browzar is **free**, it only takes seconds to download and you don't even need to install it, so you can download Browzar time and time again, whenever and wherever you need it to protect your privacy.

- No browsing history, stored files, or cookies
- No embarrassing search auto-complete
- No installation. Just click 'run' and go
- No registration required

Got something to hide? Well, where it relates to your browsing habits, anyway? Give Browzar a try.

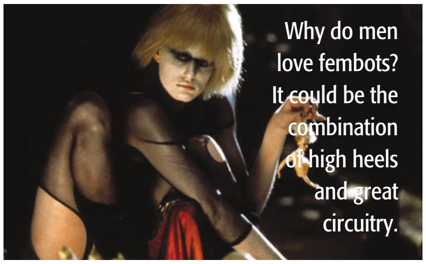
The Online, Six-String Tab Blues

Aspiring guitarists have used the Internet for years to help learn songs via tabs, or tablature, an alternative to traditional sheet music. Recently, though, sites such as Olga.net, Guitar Tab Universe, and GuitarNoise.com that post tabs that other players have transcribed are yanking the chord from the virtual amp in the face of legal action from the music industry. A statement on the MPA (Music Publishers' Association) Web site summarizes that sites providing unlicensed sheet music without permission are infringing on copyrights. Sites that make money by posting tabs (typically by selling ads) are mentioned in particular. Depending on your stance, the issue seems open to interpretation, although MPA President Lauren Keiser's statement that "anyone who patronizes these illegal Web sites is stealing just as if he or she walked out of the music store with sheet music or a guitar" is sure to sound a bad note with guitarists who argue that tabs are merely one player's interpretation of another's creation. ▲

Site Seeing

Bring In The Fembots!

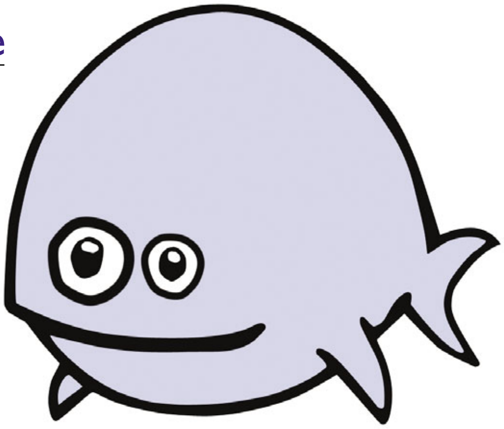
Sweet, sweet Pris, how you set our hearts aflutter—replicant or not. What is it about a sexy fembot exactly that gets a geek all worked up? Is it a fembot's alluring mix of sex appeal and technology that represents the perfect male fantasy? Annalee Newitz addresses such theories in an excellent essay she wrote that's available on *Popular Science*'s PopSci.com site (popsci.typepad.com/popsci/2006/08/your_fave_fembo.html). After you digest the essay, definitely check out the related photos, which feature such noteworthy fembots as the evil Maria from "Metropolis," Number Six from "Battlestar Galactica," and Lindsay Wagner's fembot nemesis from "The Bionic Woman." When you're done admiring the tech beauties, head to Newitz's excellent Techsploitation blog (techsploitation.com). ▲


Why do men love fembots? It could be the combination of high heels and great circuitry.

A Virtual Romp In Central Park

Central Park is one of our favorite destinations, but our Midwest locale doesn't make getting there easy. Thanks goodness for CentralPark.com. Recently named to *Time's* top 50 coolest Web sites, CentralPark.com has just about everything but real hot dogs. Our favorite stops at the site include relaxing at the Chess and Checkers House near 65th Street, paying respect to John Lennon at Strawberry Fields, seeing the animals at the zoo, and planning our next jog via the site's Runner's Map. The site's virtual tour details everything from boat rowing to sledding to the Belvedere Castle, and if this doesn't exhaust you, buy an awesome wall map ($17.99) of the park to keep it near you year-round. ▲

Compiled by Steve Smith



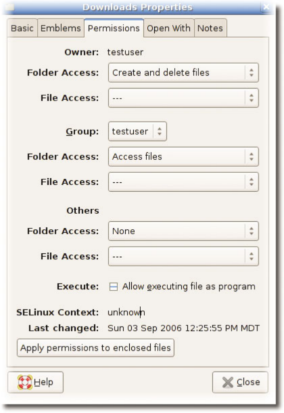
FreeDOS Turns 1.0

True PC veterans will recall that in 1994 programmer James Hall announced plans to develop PD-DOS, a public domain and free version of the PC OS. At the time, Microsoft was curtailing support for its original DOS and moving the world to Windows, so Hall and several volunteer coders decided to keep the simple OS alive in an open-source project. Renamed FreeDOS (www.freedos.org) along the way, Hall's dream hit its 1.0 milestone on Sept. 3, 2006. You can burn the OS onto a bootable CD, which you can then install on most older PCs or into PC emulators. FreeDOS is designed to let you run all of that older software and games Windows simply sniffs at as outdated and unsupportable. ▲

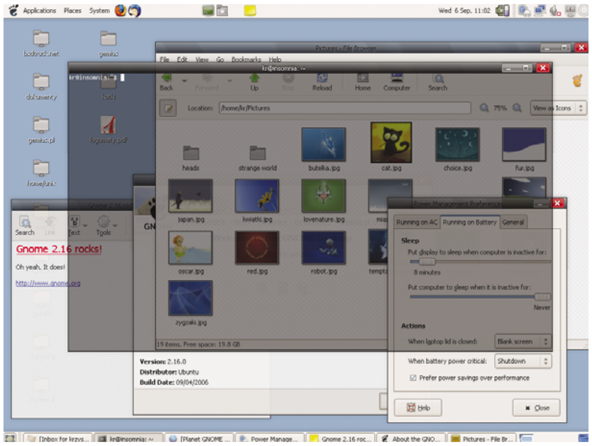
The new FreeDOS public domain version of the DOS OS traces its roots back to 1994's PD-DOS.

Gnome Hits 2.16

Another venerable open-source project breaks new ground this month with the release of Gnome 2.16 (www.gnome.org), a multiplatform desktop replacement. Running on Linux, Solaris, and BSD systems, among others, Gnome 2.16 includes a full suite of browsing, file, and editing tools. But Gnome developers adhere to usability guidelines that make the interface accessible to veterans and novices, simplify tasks, and look the same across different desktops. This version also has new 3D effects, such as windows that can wobble and fade. After years of perfecting clarity and simplicity, the Gnome developers now admit, it's time to make "the first steps into the advancing age of eye candy." ▲



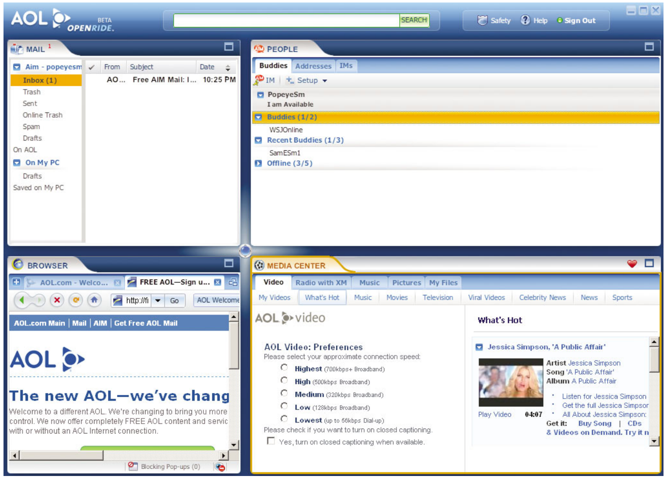
Owner: testuser
Folder Access: Create and delete files
File Access: ---
Group: testuser
Folder Access: Access files
File Access: ---
Others
Folder Access: None
File Access: ---
Execute: ☐ Allow executing file as program
SELinux Context: unknown
Last changed: Sun 03 Sep 2006 12:25:55 PM MDT



Gnome offers Linux users a new desktop experience that emphasizes usability over complex features.

AOL's New Free & Open Ride

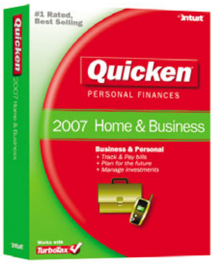
For a decade, AOL argued there was no free ride into top content and usability online and made us pay $20 or more a month for the privilege. But much of AOL's wares are now free to all, and so its upcoming software update, OpenRide tries to reimagine the connected experience. OpenRide packs browser, email, IM, and a media player into a one-screen, four-pane window. The interface resizes itself to accommodate your current task. We especially like the media player, which accesses multimedia in a single interface. The OpenRide beta is as resource-hungry as any AOL predecessor, so it may not have us flocking back to the old service. But it's good to know that the lights are still on and someone is home over at AOL. ▲



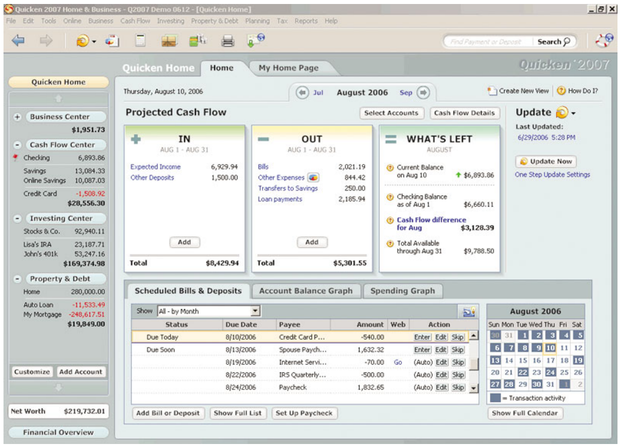
AOL's OpenRide Beta software organizes online life into a series of telescoping window panes.

Software Shorts

Prepare For 2007 Tax Season



What's left to cram into these annually updated tax software packages? This year Intuit's Quicken 2007 adds a cash flow monitor on your home page for seeing how much more is going out than coming in. Also new is the virtual file cabinet, which puts scanned documents and electronic bank statements into a safe place on your hard drive. What never changes, of course, is being charged yet again for the annual upgrade: $29.95 for the basic edition but a $20 rebate if you spring for one of the $59.95-and-up premium editions—just like the tax man, relentless and annual. ▲



Business Center	$1,951.73
Cash Flow Center	
Checking	6,893.86
Savings	13,084.33
Online Savings	10,087.03
Credit Card	-1,508.92
	$28,556.30
Investing Center	
Stocks & Co.	92,940.11
Lisa's IRA	23,187.71
John's 401k	53,247.16
	$169,374.98
Property & Debt	
Home	280,000.00
Auto Loan	-11,533.49
My Mortgage	-248,617.51
	$19,849.00
Net Worth	$219,732.01

Thursday, August 10, 2006 — Jul August 2006 Sep

Projected Cash Flow

IN AUG 1 - AUG 31		OUT AUG 1 - AUG 31	
Expected Income	6,929.94	Bills	2,021.19
Other Deposits	1,500.00	Other Expenses	844.42
		Transfers to Savings	250.00
		Loan payments	2,185.94
Total	$8,429.94	Total	$5,301.55

WHAT'S LEFT AUGUST

Current Balance on Aug 10	$6,893.86
Checking Balance as of Aug 1	$6,660.11
Cash Flow difference for Aug	$3,128.39
Total Available through Aug 31	$9,788.50

Last Updated: 6/29/2006 5:28 PM

Show: All - by Month

Status	Due Date	Payee	Amount	Web	Action
Due Today	8/10/2006	Credit Card P...	-540.00		Enter Edit Skip
Due Soon	8/13/2006	Spouse Paych...	1,632.32		Enter Edit Skip
	8/19/2006	Internet Servi...	-70.00	Go	(Auto) Edit Skip
	8/22/2006	IRS Quarterly...	-500.00		(Auto) Edit Skip
	8/24/2006	Paycheck	1,832.65		(Auto) Edit Skip

August 2006

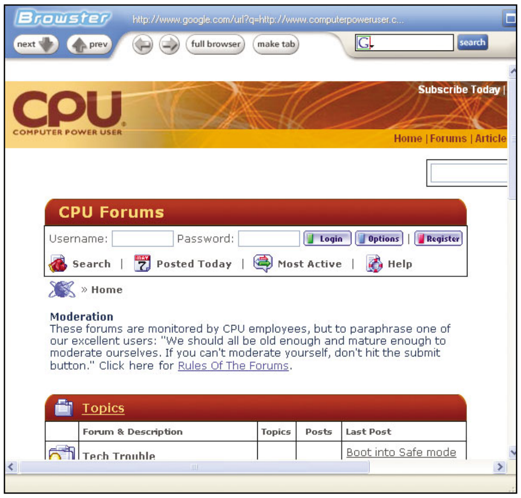
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2

Quicken 2007 is now providing a virtual vault for saving images of canceled checks, as well as a home page that lets you monitor your monthly cash flow.

A Pop-Up You'll Want

Tired of clicking into and back out of search result links? Browster is a genuinely useful and free ad-supported Web page preview window that opens the landing page without clicking through in your main browser. The add-on for Internet Explorer and Firefox puts lightning bolt icons next to every link on the search page; just hover your mouse over the link to bring up a site's window. The pop-up is a full-featured browser, so you can explore the target site, but it will disappear when you move the mouse off of the Browster window. This is one widget we actually use every day. ▲

Browster previews any link on a search result or Web page in its own fully functional window.



Moderation

These forums are monitored by CPU employees, but to paraphrase one of our excellent users: "We should all be old enough and mature enough to moderate ourselves. If you can't moderate yourself, don't hit the submit button." Click here for Rules Of The Forums.

Forum & Description	Topics	Posts	Last Post
Tech Trouble			Boot into Safe mode

BIOS Upgrades Available Online

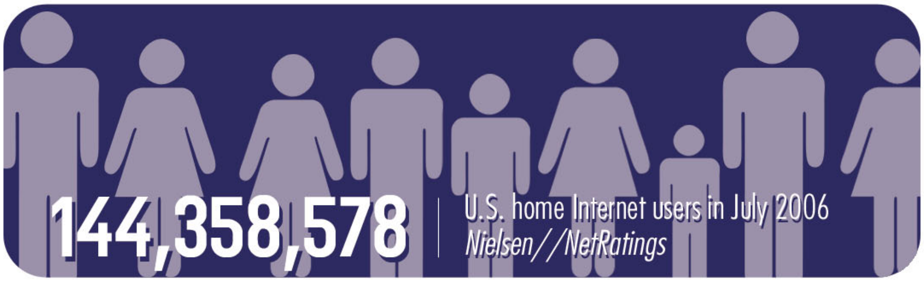
Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpunov06/bios to see our entire upgrade list.

Motherboard	Date Available	URL
AAbit KN95	8/21/2006	www.abit-usa.com/downloads/downloads.php?file= ftp://ftp-usa.abit.com.tw/pub/download/bios/kn9/kn915.zip
AOpen i975Xa-YDG	8/19/2006	download.aopen.com.tw/userdownload_List.aspx?RecNo=10965&Model=i975Xa-YDG
ASRock AM2NF6G-VSTA BIOS	8/17/2006	download.asrock.com/bios/AM2/AM2NF6G-VSTA(1.20)Win.zip
Asus Vintage2-PH2	9/1/2006	ftp://dlsvr03.asus.com/pub/ASUS/Barebone/Vintage2-PH2/V2PH2_0409.zip
BioStar Tforce 550	8/7/2006	ftp://ftp.biostar-usa.com/bios/TFORCE%20550/N5taa807.bst
Intel D975XBX	8/21/2006	downloadfinder.intel.com/scripts-df-external/confirm.aspx?httpDown=downloadmirror.intel.com/df-support/11504/eng/BX97510J.86A.1351.EB.EXE&agr=N&ProductID=2205&DwnldId=11504&strOSs=38&OSFullName=OS%20Independent&lang=eng
Soltek SL-P4M800i-478R/RL	9/5/2006	www.soltek.com.cn/products/bios/biosfile/SP4M8102.rar

The Job Search

Do you like to laugh as much as you like to code HTML Java and XHTML? Or perhaps you just find coding itself funny. In either case, then you may have the sense of humor and programming chops to help NBC launch what may be the next big comedy channel on the Web. NBC Universal, which has been known to put on a sitcom here and there (um, "Cheers," "Seinfeld," "Saturday Night Live"), is preparing a new Web site called DotComedy. It wants Web designers who appreciate standup and clean lines of code. The Senior Web Producer will make and maintain the library of video content the site plans to run. NBC Universal prefers an individual who likes to laugh and knows his sitcom and standup history because he will be developing new programming and packaging clips from the classics such as "SNL," "The Tonight Show," and "Leave It To Beaver." Yes, the Beav is back, and you get to bring him to broadband.



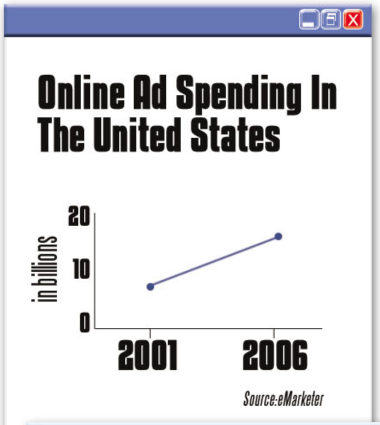
144,358,578 U.S. home Internet users in July 2006
Nielsen//NetRatings

6.3 BILLION
Online searches conducted in the United States in July 2006
comScore

218,182,871
U.S. wireless phone subscribers in Aug. 2006
CTIA

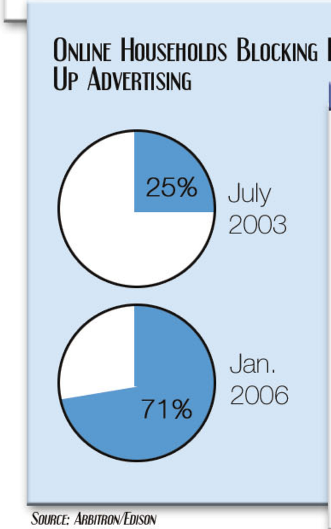
Speed Thrills

The pace of change in the online economy has been truly breathtaking. Take a look at some of the businesses, such as search, social networking, and online video, that simply didn't exist as little as a few years ago. The warm-up was a bit longer than some had hoped, but the digital economy has now shifted decidedly into overdrive.



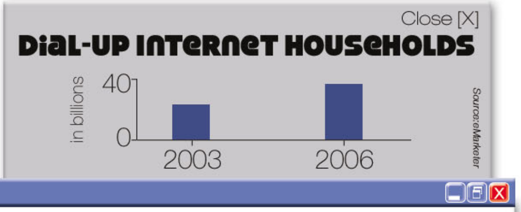
Online Ad Spending In The United States

Source:eMarketer



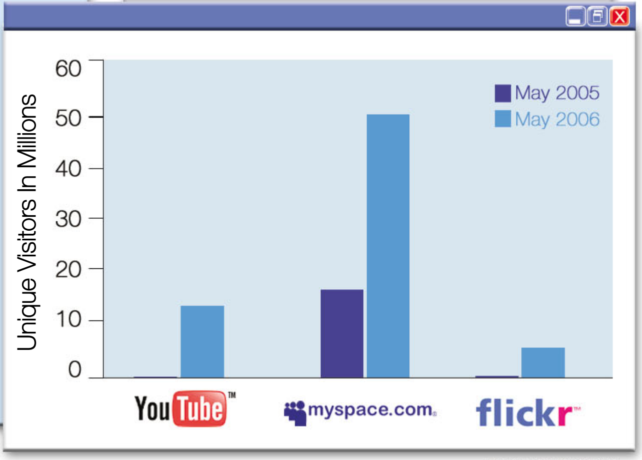
Online Households Blocking Pop-Up Advertising

Source: Arbitron/Edison



Dial-Up Internet Households

Source:eMarketer



Source: Media Metrix

EPP Enhanced Performance Profiles

Cool Performance

HOW CORSAIR MAINTAINS

TECHNOLOGY LEADERSHIP

CORSAIR™

INNOVATION
PERFORMANCE
RELIABILITY

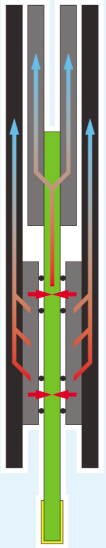
Here's the latest in Corsair's ten year heritage of innovation in performance memory: we've redefined memory heat sink technology. And the result is unprecedented performance and reliability. When we ran a preview module through system benchmarks at COMPUTEX, an overclocked DHX module with our optional airflow fan was able to hit a heart-stopping 1250MHz (PC-10,000) while maintaining cool, reliable performance.

Protect Components While You Push Performance

Pushing performance specs generates heat, and that can compromise reliability and component life. The advanced cooling ability of DHX heat sinks keeps your memory safe and reliable even as you push it to the limit. Under the name XMS2 Dominator, this DHX technology will be showing up on both Corsair parts designed for extreme overclocking and on memory designed for performance computing and gaming.

Also Featuring Enhanced Performance Profiles (EPP)

As with all new Corsair performance memory, XMS2 Dominator modules feature EPP, the new open standard for the Serial Presence Detect (SPD) jointly developed by NVIDIA and Corsair. EPP simplifies overclocking for beginners and provides unparalleled control for experts.



AIRFLOW

An optional fan (not shown) provides even more cooling and protection.

DHX DUAL-PATH HEAT XCHANGE

Corsair's proprietary DHX technology dissipates heat two ways: it draws heat away from the module through the RAMs and provides an additional path for heat transfer within the module through the ground plane!

ORDER FROM THESE OFFICIAL CORSAIR RETAILERS OR VISIT WWW.CORSAIRMEMORY.COM

Fry's Electronics | Micro Center The Ultimate Computer Store | newegg.com® | TigerDirect.com | ZipZoomfly.com

The Saint

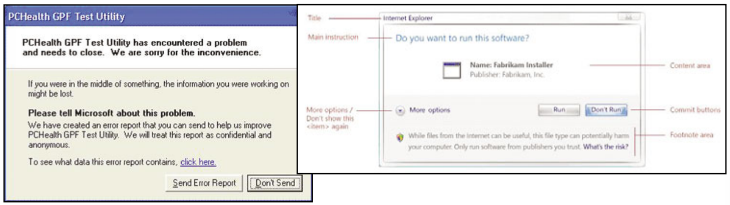
Brake

by Alex St. John

Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades Of The Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is president and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM quality entertainment content over the Web.

I'm driving my car to work and out of nowhere, one of those meaningless little red warning lights comes on. It very brightly and dangerously says: *Brake*. Something is wrong with my brakes, apparently. It doesn't say what is wrong; it doesn't give any indication of what I should do about it. Just: *Brake*. The deep sense of rage and indignation I feel about the meaningless warning light reminds me that I need to take some time to review the Vista RC1 and tell everyone about Microsoft's latest assault on common sense and good user experience. I hear it's improved a lot since Beta 1 was released, but then I think everyone using the beta has achieved a sufficiently low state of expectations to be excited by any improvement.

Many years ago, before I joined the Empire, I was a Mac guy. We used to make fun of Microsoft for copying everything Apple did, badly. There was one feature of the Mac that I really loathed that Microsoft finally seems to have topped with Vista. It was the error dialog the old Mac OS posted when it crashed.



PCHealth GPF Test Utility has encountered a problem and needs to close. We are sorry for the inconvenience.

If you were in the middle of something, the information you were working on might be lost.

Please tell Microsoft about this problem.

We have created an error report that you can send to help us improve PCHealth GPF Test Utility. We will treat this report as confidential and anonymous.

To see what data this error report contains, click here.

Do you want to run this software?

Name: Fabrikam Installer
Publisher: Fabrikam, Inc.

While files from the Internet can be useful, this file type can potentially harm your computer. Only run software from publishers you trust. What's the risk?

A little bomb would appear next to a message that read something like, "Your system has crashed, formatting hard disk and forwarding your porn collection to your mother. OK?" There was only one button to click: OK. There was no other button that said, "No, it's not OK! Go do your damn jobs, Apple, and make your software work!" You couldn't proceed to crash and lose everything you'd been working on until you tacitly forgave them and clicked the OK button. Windows' blue screen of death was annoying, but at least it was unpretentious; it just sort of snuck up and blew a spray of incomprehensible hex code at you. They improved on this in Windows XP, with a new dialog that gave you some false sense of control over your computer's doomed state.

This dialog contained a much subtler set of insults to the user, but at least its creators had the decency to apologize before offering to run their spyware on your computer and pretending that you might be smart enough to make heads or tails out of the error report they were offering to send themselves. The presence of two buttons gave you the pleasant illusion that you had some choice in the situation. It did a good job of making you feel a little guilty for being annoyed with them if you were unwilling to help them out with the problem by hitting the Send Error Report button. I suspect that Microsoft hired a team of psychologists to help them design this dialog.

Vista, on the other hand, takes a twisted sort of post-9/11 approach to warning dialogs. All software not provided by Microsoft is a potential threat to your privacy and your computer that you need to be protected from. If you're dumb enough you'll believe that somehow flying is safer because you're not allowed to bring water on the plane because it might be an explosive, but if you check it in your luggage, that's OK. Cell phones continue to pose some grave unspecified threat to flying, but terrorists always turn theirs off if you ask them nicely before the flight departs. Real security is awfully difficult to achieve, but a false sense of security supported by lots of dramatic warning dialogs and fruitless searches makes us all feel a little better.

"Only run software from publishers you trust." Are you kidding me? What about software from publishers that make buggy, insecure software that I have to use because there is no alternative? What about software from publishers whose software I can't even begin to comprehend without a four-year degree in computer science, a month with a debugger, an MBA, and a careful study of their business to understand if the way their software works is necessary and responsible or not?

Well, I'd better take my car to a service shop I "trust" to fix whatever caused the "brake" light to come on and hope they don't just reset it and charge me a thousand bucks to replace a broken Framazoid, because I wouldn't know the difference. ▲

Many years ago, before I joined the Empire, I was a Mac guy. We used to make fun of Microsoft for copying everything Apple did, badly.

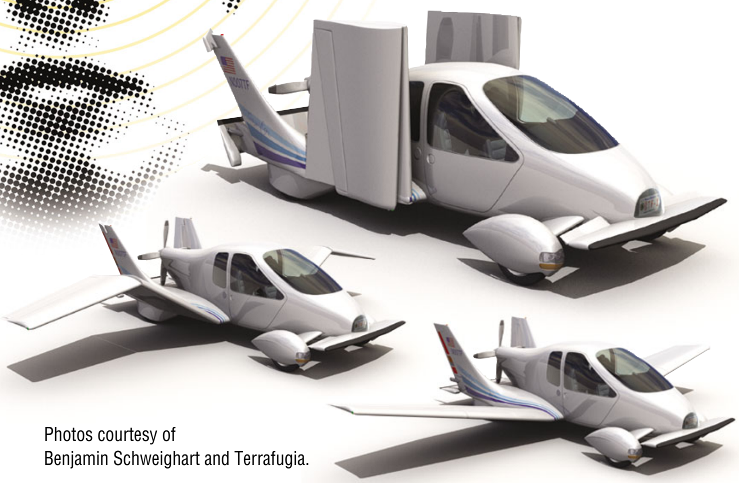
Send your feedback to thesaint@cpumag.com

DREAM HARDWARE

These Gizmos Don't Sing It, They Bring It

This month's "Dream Hardware" is up in the air. You've been sleeping on a slab suspended above the floor. Your new flying car is more than meets the eye. Back on earth, there's a bright red supercar that puts the "green" in "green with envy."

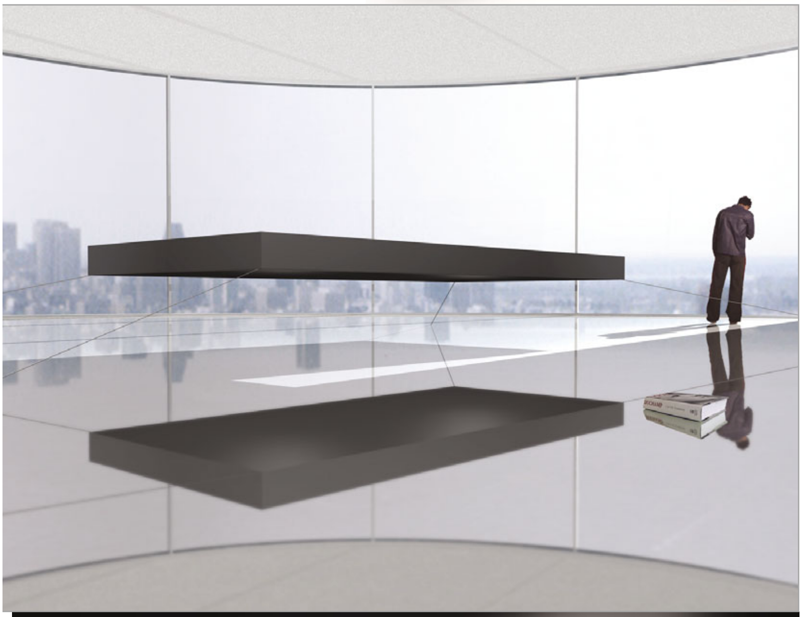
by Marty Sems



Photos courtesy of
Benjamin Schweighart and Terrafugia.

Terrafugia Transition

Twenty years on, and I'm still waiting for my own personal Transformer. Terrafugia's Transition (www.terrafugia.com) is literally a car that converts into a Special Light Sport Aircraft. Its wings fold out and a clutch redirects engine power from the tires to the propeller. A digitally generated "glass cockpit" dash screen tells the pilot all she needs to know. GPS, weight balancing sensors, and rear vision cameras are probable future additions. Solid Works CAD, vortex-lattice aerodynamic modeling, and CNC machining made the Transition possible. Get your $148,000 ready for the first delivery date in 2009.



Floating Bed

"I'm sorry, Dave. Sleep is too important for me to allow you to jeopardize it." Thirty-three-year-old architect Janjaap Ruijssenaars was inspired more than most by the monolith in the 1968 sci-fi classic "2001: A Space Odyssey," so he did what any red-blooded Dutch would do: He made a gravity-defying magnetic bed out of it. The Floating Bed (www.universearchitecture.com) uses neodymium "rare earth" magnets from Bakker Magnetics (www.bakkermagnetics.com) to hold almost a ton of mass 16 inches off a magnetic floor. Thin steel lines keep the Bed from slipping out of place. Steel plate construction with empty interior spaces keep the field gentle above the Bed so that it won't mess with your dental fillings, but those plates also make the top surface rival mattresses in China for hardness. If you can't rest easy after spending $1.5 million on your new bed, as HAL 9000 would say, it can only be attributable to human error.

Photos by RJ Muna

Tesla Roadster EV

If the name Tesla makes you think "coil" instead of "hair metal," here's the car for you. It's the most ostentatiously fun way to go green I've seen. The Roadster EV (www.teslamotors.com) is merely the latest proof that dead dinosaur goo doesn't have a monopoly on tire-shredding performance. The electric supercar can hit 60mph in four seconds. A 3.5-hour recharge of the Li-Ion battery from an ordinary wall socket will take you 250 highway miles. Tesla claims that this works out to an operating cost of about a penny a mile, or the equivalent of 135mpg. The Roadster is rolling out early next year in California, then at Chicago, New York, and Miami dealerships later on. Pricing reportedly will be in the $80,000 to $120,000 range; the first hundred special edition cars sold out at $100,000 each. ▲

The Draft-n Debacle

802.11n Will Probably Rock, But Not Today

You know the promise: Today's draft version of the 802.11n wireless networking standard can provide transfer speeds of nearly 300Mbps over distances several times that of 802.11a/b/g. So be warned . . . this is not a feel-good story. Nothing that we looked at in this review came remotely close to meeting those expectations. Is it any wonder that the IEEE decided to delay ratification of the new standard until late 2007 or early 2008? What draft-n provides at this time is an occasionally faster wireless connection and the alleged ability to upgrade to the full standard once it becomes available. (Vendors keep using the word "probably" upgradeable, but no one is guaranteeing it.) This upgradeability was not available in older technologies, such as pre-n and 802.11g MIMO. Also, with a fully ratified standard, other benefits, including interoperability among venders, can be realized. Unfortunately, we're not quite there yet.

How We Tested

For this review, we looked at draft-n routers and PC cards from Belkin, D-Link, Buffalo, Netgear, and Linksys. We did not look at the interoperability among brands, even though that's one of the promised benefits of 802.11n, as our goal was to do a competitive comparison among the vendors. Also, note that our CPU ratings are relative to each other, not the entire market. Otherwise, we wouldn't have awarded any of these products a score higher than 2 CPUs.

The testing was done to reflect real-world conditions in an everyday, two-story home. This is not the best place to get maximum performance out of these products for several reasons, the foremost being interference from competing networks. In our test environment, six to 10 other wireless networks could be detected at any given time. Also, it's hard to determine exactly what construction materials lie between the router and the card. The more metal or wires that run through floors and walls between the router and client, the greater their impact will be on your WLAN signals. For best throughput results, we recommend usage in a remote location on a very tall mountaintop. Say, in Nepal.

Our routers were located in an upstairs corner room that serves as an office. They were placed near the top of a cabinet to minimize interference from other electronic equipment in the room. All routers were set to use wireless channel 8 to keep interfering factors as constant as possible.

We ran tests at three locations: in the same room about six feet from the router being tested, downstairs at the opposite corner of the house (approximately 50 feet away and through the floor and several walls), and in the backyard on the opposite side of the house from the office (about 75 feet away). The third location was the worst, as both physical barriers between our notebook and the routers and external 2.4GHz interference were at their maximums.

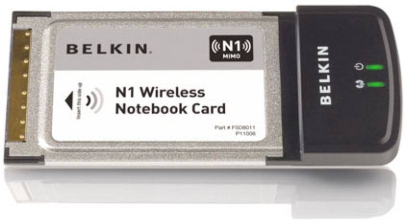
To measure the network speed, we compiled a 300MB collection of multimedia, text, and system files and sent this from an HP Compaq nc8000 laptop to a Gigabit Ethernet-enabled PC attached to the test router in the office. While the transfer was taking place, we used pmaSoft's OnlineEye to monitor the transfer rate in Mbps over a one-minute period of time. The program graphed the transfer rate in real-time, sampling every half-second. The resulting graphs appear in our results table along with the numeric results obtained during testing. The graphs show a blue line for the transfer rate, a yellow line for the rolling average, and a gray line for the scale median.

Using this program allowed us to observe some phenomena that wouldn't have shown up if we simply timed our transfers. The first of these was that as distance—and most probably interference—increased, transfer rates became more erratic. This was the case for all equipment and seemed to have a profound effect on the speed of our transfers. Another thing was the consistency of the throughput throughout the entire transfer. Some equipment demonstrated high transfer rate periods but failed to maintain them for extended time periods. We'll dig into this more within each review.

In a word, the results were disappointing. We expected much higher transfer rates, even under congested, real-world circumstances. At the outset, we were told to expect results of 100Mbps and above, so we doubted our settings and procedures until walking through the testing with two manufacturers, who obtained very similar results to our own. To achieve anywhere near the theoretical limits, several impractical things would need to happen, such as renting a multimillion-dollar, no-interference test chamber or toting large battery packs up that Nepalese mountain.

Belkin

The Belkin N1 router has one of the most attractive and intuitive user displays of the products we tested. Glowing front-panel icons make it easy to instantly verify the status of all major functions. For example, as the router booted and connected to the Internet, the modem icon would blink amber to show it was connecting, then blue once the connection was complete. There are similar icons for Internet status, wireless LAN connection, security status, and so on. Speaking of wireless security, the N1 supports WEP, WPA, and WPA2, which are all easily configured via Belkin's friendly browser-based user interface. The installation and configuration software for



N1 Wireless Router (F5D8231): $149.99
N1 Wireless Notebook Card (F5B8011): $99.99
www.belkin.com
●●●

the PC Card made meshing it with the router's settings quick and painless.

In testing, Belkin's gear delivered similar throughput numbers to the competition; however, the transfer profile was very consistent. Once a transfer was in progress, the bit rate stayed at or near the maximum levels until the session's completion. In examining the office location results, you can see that the bit rate jumped up quickly as the transfer began and stayed at or near the maximum. The downstairs test showed the same pattern even though the bit rate dropped off appreciably. In the backyard, though, the lack of signal strength took its toll, producing a much rougher curve and a significant throughput drop.

But in the end, even though Belkin showed much lower bit rates at distance versus the draft-n promise, the consistency of the throughput over time made for comparatively dependable file transfers within our test group.

D-Link

The D-Link RangeBooster N 650 has a very sleek look and feel, as well as the smallest physical size of all the routers we examined. The front indicator display is cramped and more ambiguous than Belkin's but relatively easy to grasp after a quick glance at the manual. Setup using the supplied install disc went smoothly, as did browser-based configuration. One noob-friendly feature of this UI is that it always provides Helpful Hints in a pane to the left of every configuration window. These hints also provide a link to more in-depth information, if needed.

The initial firmware release we tested does not support WEP security along with the WPA and WPA2 settings, so remember to upgrade if you're working with WEP-enabled clients. On the plus side, the router offers both SPI and NAT firewall protection, as well as the same QoS prioritization engine found in D-Link's GameFuel parts. D-Link also outfits the router with UPnP server capabilities and a USB port for WCN (Windows Connect Now) configuration. The Notebook Adapter's software wasn't as clean or easy as that of some other models, but it provides all of the necessary functions.

D-Link delivered the best overall results in our tests even though it didn't have the top overall bitrates. The primary reason for this was its relatively high sustained throughput level at each of our test locations. The office transfer speed was around 20% less than competitors, but the fact that throughput did not significantly drop off at greater distances tells us that D-Link is closer than its peers to reaching "true" draft-n performance. Even with its worst rate of around 23Mbps, one might still be able to stream HD video at a significant range. Our transfer profiles were also very consistent, with no significant dropouts seen during the tests. The dropoff shown on the graph at the end of our office run was the file transfer's completion.

Buffalo Technology

The Buffalo Nfiniti sports an imposing, if charmless, vertical design punctuated by three top-mounted antennas. (We kept thinking, "Bad antenna day!" every time we looked at it.) Under the bland gray/black exterior, though, the unit has an unusually neat, neophyte-level GUI for configuring port forwarding, along with advanced options for the more technically inclined. The "easy-access" integrated help found on most competing models ranged from hard-to-find to nonexistent, but Buffalo delivers handy assistance in spades.

The big standout on this product is the AirStation One-Touch Secure System, or

RangeBooster N 650 Router (DIR-635): $139.99
RangeBooster N 650 Notebook Adapter (DWA-645): $85.99
www.dlink.com
●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

AirStation Nfiniti Wireless-N Router & Access Point (WZR-G300N): $149.99
AirStation Nfiniti Notebook-N Adapter (WLI-CB-G300N): $99.99
www.buffalotech.com
●●●

AOSS. This lets users create a secure connection between the router and other AOSS-compatible devices with one touch of a button located near the antennas. This puts the router into a negotiation mode. Just click the AOSS button in the client app on the notebook, and one mutual WPA key is configured and running. Other high points include dual firewalls, intrusion detection, an access point mode, and the ability to work as a WDS-based repeater.

We like some of Buffalo's nods to advanced users, such as the removable side panels, one of which conceals a settings cheat sheet so you don't have to keep referencing the manual. That said, there are few surprises here. No QoS, no tie-ins to Buffalo's LAN storage or multimedia devices, and the notebook card's client software is surprisingly bland, operating mostly as a setup tool rather than taking over for Windows' Zero Configuration Utility.

Buffalo's equipment tested comparatively well, showing decent numbers at all locations. It also delivered some of the flattest transfer profiles seen and thereby relatively fast file transfers. However, we found that the notebook card was very susceptible to human body contact. We could drive the bit rate to near zero just by placing a hand on the card during the testing. Without such contact, performance was fine.

Netgear

Hands down, Netgear's RangeMax Next is the sexiest draft-n router in our roundup, simultaneously seeming to channel the aesthetic of Apple's iPod and the mysterious power of a "2001" monolith. There are no external antennae—a fact that didn't seem to im- pact the router's performance—and the LEDs are spartan at best.

Our favorite feature by far here is the integrated four-port gigabit switch. Even now, few vendors seem to grasp the importance of gigabit Ethernet, and it only makes sense that if you make a router with wireless connections able to hit 150 Mbps, you might want wired connections able to keep pace. (Obviously, in this roundup, we were a long way from reaching the Fast Ethernet bottleneck.) Another smart Netgear feature is an automatic firmware upgrade function you can set to run manually or automatically upon every user logon. Configuring the wireless security in WEP, WPA, and WPA2 was a snap. This router also provides extensive help as needed when adjusting any setting. The notebook card software and user interface are quite good, even providing some graphs showing bit rate changes over time.

During testing, Netgear's performance was quite inconsistent, as you can see in the transfer profiles at all locations. Even though this equipment did achieve the highest throughput instance in our roundup, the bit rates were all over the map, trashing overall transfer times. We obtained the test results shown in our chart with the most recent firmware available at press time (version 1.3.04). In earlier testing with older firmware, transfer profiles were much more consistent, although they didn't reach the new version's throughput peaks. Also, bit rates dropped considerably more than expected as distance increased.

RangeMax Next WNR854T Wireless Router Gigabit Edition: $159.99
RangeMax Next WN511T Wireless Notebook Adapter Gigabit Edition: $99.99
www.netgear.com
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Linksys

Based on looks alone, you'd swear the WRT300N, with its massive hood ornament of a central antenna, would blow away the competition. Unfortunately, the tri-antenna array appears to be all too ornamental, and the WRT300N turned in by far the lowest performance we observed. Yes, the blue shell is very Linksys-esque,

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

WRT300N: $149.99
WPC300N: $119.99
www.linksys.com
●

and the browser-based configuration UI is as friendly as ever. Security nuts will appreciate that this unit offers six wireless security modes, and Linksys offers an access point mode, DMZ, and QoS on the Wi-Fi Multi Media type for audio and video apps. Wizard-based help and options are both plentiful—everything from VPN pass-through to dynamic DNS accommodation—and the notebook card's client software is equally simple to configure in just a couple minutes.

With so much greatness on the spec side, the Linksys equipment was our

D-Link Q&A

So what's the real story behind draft-n? Why are there so many delays? And why don't the current products deliver on the spec's promises? We spoke with insider and straight shooter George Cravens, technical marketing manager for D-Link.

CPU: The results of our draft-n roundup were disappointing, without exception. And these were near-spec, shipping products! What gives?

GC: Here it is. We're a really good neighbor with draft-n, and we need a bad neighbor mode. We've seen that our notebook adapter will pick up significantly more access points in a given area than the competitors do. That's the good news. The bad news is that as a result we're going to play good neighbor more often. We're not going to go into 40MHz mode if we see activity in that other channel. So in a normal environment with regular activity around, we're not using that 40MHz very often. We don't have that static turbo mode that blows everybody around you away. If we did, you'd be sitting there going, "Look at that! It's going 150Mbps!" But your neighbors would hate you.

CPU: But there are reviews out there showing results well over 100Mbps, just like the marketers promise.

GC: To be truthful, we've never even seen 100 megabits yet. Never. I've seen some crazy reviews in the press, and I don't know what those guys are talking about, but the good reviews are all consistently seeing 40 to 50Mbps.

CPU: Is draft-n interoperability similarly exaggerated?

GC: By the time you print, we should have a firmware update for the 635 that will improve throughput and interoperability. I mean, they all interoperate, but in some cases they're doing it in 11g mode.

CPU: With draft-n nearly done, what's the next big wireless advance?

GC: Well, in the second half of next year, we'll have the second generation of n products that will likely be dual-band. The standard supports bonded 2.4GHz and 5GHz operation. And that'll get you some screaming-fast throughput.

CPU: So today's client cards, while limited to single-band, will still be compatible with the dual-band technology, but I'll have to upgrade my router?

GC: That's right. The nice thing is that you've got a lot of nonoverlapping channels in the 5GHz band. So you'll get the speed on 5GHz and the range on 2.4GHz. They combine nicely.

CPU: That's a lot of change in a product group that we're all thinking is finally going to stabilize. Which takes us back to the big question: How can we be sure that draft-n, unlike pre-n, is actually going to comply or be upgradeable to the final spec?

GC: Atheros and Broadcom did a joint press release about how they're cooperating on this wireless standard so we don't have all the proprietary nonsense of the last generation. When's the last time you saw Intel and AMD do a joint release? This just doesn't happen. Everyone has agreed on the standard. That's why we don't see the standard changing much from this point on. The companies have realized that this market is so big; they don't have to struggle for that last percent at the risk of slowing down adoption. They'd rather hold hands, sing "Kumbaya," and dig into the bigger pie.

CPU: So with everybody locked in a lovefest, why is ratification taking so long?

GC: The IEEE had like 12,000 comments to resolve. Each one of those takes time, and you need a 75% OK for any little change. It's damn time consuming. On top of that, some of the players have their own agendas, and they don't want to change their hardware if they don't have to. But I've heard that by the January IEEE meeting, they'll have everything resolved. Final ratification doesn't happen until six to nine months after the final change because of the way the process works. Believe me, we want ratification, too, so we can start pumping out bridges and media adapters and whatnot. Take a deep breath. We're almost there.

biggest disappointment. It was on par with or better than most in our close-range office testing, although the transfer profile looked shaky. From there, things went downhill fast. The gear's effective distance proved even less than some of our dusty 802.11b gear. Despite showing some signal strength at our outdoor location, the laptop could not connect well enough to start a transfer. That said, the WRT300N was one of the first draft-n parts on the market, and Linksys has a follow-up nearly ready for release. Rather than miss them altogether in this roundup, we pleaded for them to make the older router available to us against their will. If Linksys can keep the good things about this router while boosting performance in the revision, the results should be excellent.

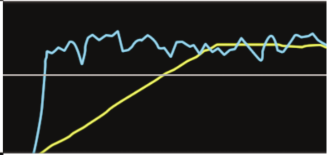
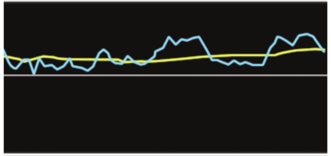
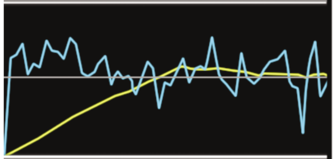
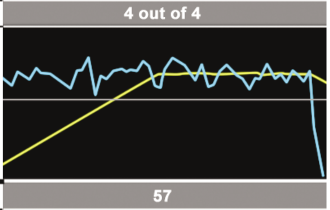
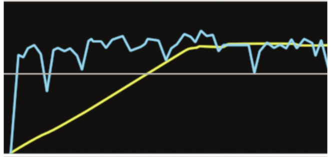
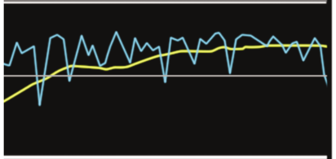
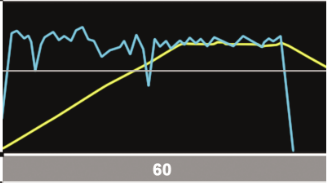
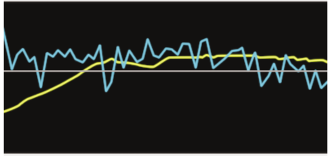
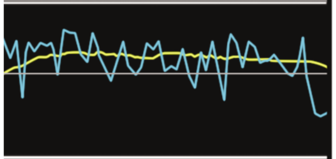
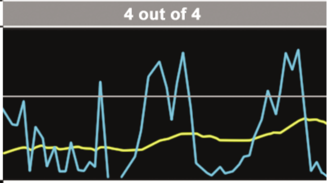
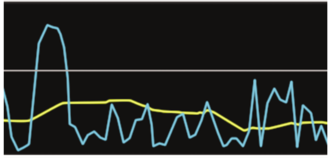
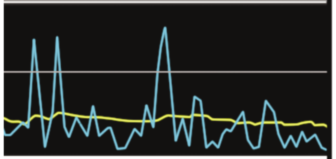
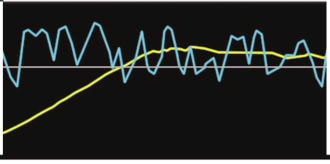
Parting Thought

All of the draft-n gear we tested failed to meet our expectations. Real-world transfer rates were somewhat higher than vanilla 802.11g but nowhere near the advertised ones. Historically, it's been reasonable to figure that real-world rates are about half of the theoretical maximums advertised. Today's draft-n parts scrap that unwritten law. And even this we could live with if throughput didn't walk off a cliff the minute you start putting distance and obstacles between the router and client.

Sad but true, if you want speed and distance, 802.11g MIMO remains your best bet. We hope that the second generation draft-n releases from manufacturers finally deliver on the draft-n spec's potential. Still, we wouldn't bet on firmware updates to today's products to do the trick, at least not without seeing the improvement firsthand. ▲

by Billy Ristle

Draft-N Results By The Numbers

Brand		Office	Downstairs	Backyard
Belkin	Transfer Speed (Mbps)	55	22	8
	Signal Strength (Bars)	5 out of 5	4 out of 5	2 out of 5
	Transfer Profile			
D-Link	Transfer Speed (Mbps)	48	33	23
	Signal Strength (Bars)	4 out of 4	4 out of 4	2 out of 4
	Transfer Profile			
Buffalo	Transfer Speed (Mbps)	57	20	15
	Signal Strength (Bars)	5 out of 5	3 out of 5	3 out of 5
	Transfer Profile			
Netgear	Transfer Speed (Mbps)	60	25	8
	Signal Strength (Bars)	4 out of 4	2 out of 4	2 out of 4
	Transfer Profile			
Linksys	Transfer Speed (Mbps)	58	Failed to Transfer	Failed to Transfer
	Signal Strength (Bars)	14 out of 15	4 out of 15	0 out of 15
	Transfer Profile		Failed to Transfer	Failed to Transfer

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

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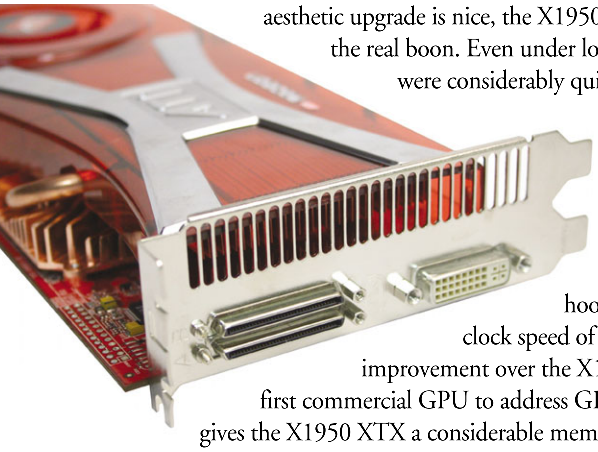
Vantec Thermal Technology, Inc.
43951 Boscell Road. Fremont, CA 94538
Tel. 510.668.0368 Fax. 510.668.0367

ATI Radeon X1950 XTX & X1950 CrossFire Edition

There haven't been many sunny days at *el campo rojo* these past few years. Sure, the Xbox 360 has been a hit, and once the Wii arrives, two out of three next-gen consoles will have an ATI graphics processor. But leaving consoles aside, ATI has had to weather setback after setback. Nvidia was first out of the gate with multirendering; the X1800's repeated delays left ATI without a flagship GPU for months.

ATI should really consider its X1950 series a feather in its cap, so to speak. For starters, the heatsink and fan received a complete overhaul. Impressive, piped copper heatsinks keep the card's GPU and memory cool while the fan draws air in from the case and jettisons it out over the heatsink. ATI also replaced the shroud with a slick, translucent red plastic, which I infinitely prefer over the creepy Paris Hilton-esque rendition of Ruby that graced the X1900 series' shroud. Although the aesthetic upgrade is nice, the X1950 XTX's noise output is the real boon. Even under load, the X1950 cards were considerably quieter than the lawn mower-level sound that came from X1900 cards.



The X1950 series cards have a couple of tweaks under the hood: The R580+'s core clock speed of 650MHz isn't an improvement over the X1900 XTX, but it's the first commercial GPU to address GDDR4 memory. This gives the X1950 XTX a considerable memory bandwidth over its predecessor (a 29% improvement, according to ATI).

ATI rectified the discrepancies between the X1900 XTX's and X1900 CrossFire Edition's core and memory clock speeds that forced the X1900 XTX to pull the reins on its horses in a CrossFire setup, so to speak. The X1950 CrossFire Edition's clocks are identical to the X1950 XTX's, so the X1950 won't take a performance hit in CrossFire.

I threw the X1950 XTX into the ring against XFX's GeForce 7950 GX2 on three different platforms: Intel's 975X, Nvidia's nForce 590 SLI, and ATI's own CrossFire Xpress 3200. I tested single-card configurations on all platforms and used the nForce 590 and CrossFire Xpress motherboards for Quad SLI and CrossFire testing, respectively. I benched the X1950 CrossFire Edition as a single card but didn't include results because, as I expected, the identical clocks produced virtually identical scores as the X1950 XTX.

With the exception of Oblivion, the GeForce 7950 GX2 emerged victorious in 3DMark06, F.E.A.R., and Quake 4, but the X1950 XTX wasn't far behind. The X1950s shined in CrossFire and even edged my Quad SLI setup in 3DMark06. With half as many GPUs at its disposal, the X1950 XTX holds its own.

Of course, the lynchpin is ATI's SRP: $449. Provided ATI and its partners can actually release cards at this promised price (and on time), the X1950 series will give Nvidia a serious run for its money. ▲

by Vince Cogley

Radeon X1950 XTX & X1950 CrossFire Edition
$449
ATI
www.ati.com
●●●●◖

Benchmark Numbers

Sapphire PC-AM2RD580

	XFX GeForce 7950 GX2	ATI Radeon X1950 XTX	ATI Radeon X1950 CrossFire
3DMark06			
Overall	8343	6259	9865
SM2.0	3771	2447	4417
HDR/SM3.0	3638	2708	4825
CPU	2137	2154	2159
F.E.A.R. 1.07			
1,600 x 1,200 4XAA/8XAF	74	55	84
Quake 4 Demo 001			
1,600 x 1,200 4XAA/8XAF	93.4	63.8	108.6
Elder Scroll IV: Oblivion			
1,600 x 1,200 HDR/16XAF			
Indoor	57	56.7	60
Outdoor	41	49	59.75

Asus M2N32-SLI Deluxe

	XFX GeForce 7950 GX2	XFX GeForce 7950 GX2 Quad SLI	ATI Radeon X1950 XTX
3DMark06			
Overall	8367	8697	6315
SM2.0	3789	3892	2473
HDR/SM3.0	3663	3958	2730
CPU	2122	2116	2170
F.E.A.R. 1.07			
1,600 x 1,200 4XAA/8XAF	75	102	56
Quake 4 Demo 001			
1,600 x 1,200 4XAA/8XAF	110.4	117.5	64.36
Elder Scroll IV: Oblivion			
1,600 x 1,200 HDR/16XAF			
Indoor	57.1	60	56.7
Outdoor	40.2	44.5	48.4

Intel D975XBX

	XFX GeForce 7950 GX2	ATI Radeon X1950 XTX
3DMark06		
Overall	8670	6639
SM2.0	3800	2542
HDR/SM3.0	3665	2813
CPU	2476	2558
F.E.A.R. 1.07		
1,600 x 1,200 4XAA/8XAF	76	56
Quake 4 1.2 Demo 001		
1,600 x 1,200 4XAA/8XAF	97	64.21
Elder Scroll IV: Oblivion		
1,600 x 1,200 HDR/16XAF		
Indoor	58.6	56.4
Outdoor	38.4	48.7

Specs: GPU: Radeon X1950; Core clock speed: 650MHz; Memory: 512MB; Memory clock: 1GHz (2GHz effective)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

AMD Athlon 64 3800+ EE/SS & Athlon 64 4600+ EE

The wattage gap between gaming and standard desktop PCs is widening. Multiple video cards, ultra-speedy CPUs, watercooling equipment, and sometimes bragging rights send gamers in search of 1,000W PSUs, while users who want energy-efficient, compact desktops are paying attention to power consumption. We've already seen AMD's top-shelf FX CPUs, so I looked at two processors that cater to the low-power user segment. Both processors are dual-core Athlon 64 X2 CPUs.

AMD breaks its power-friendly line into two categories: EE (Energy-Efficient) and EE/SS (Small Form Factor), which have 65 and 35W max thermal power ratings, respectively. That's a significant drop from a standard Athlon 64 X2 processor's max of 89W. You can determine an Athlon 64 X2's thermal max by looking at the third letter on the processor's OPN. An A indicates that the processor has a standard 89W thermal max, while a D represents the 35W CPU and an O represents a 65W CPU.

The 2.4GHz Athlon 64 X2 4600+ and 2GHz 3800+ share many traits. For one thing, they both require AM2 (940-pin) motherboard sockets and are built in AMD's Dresden, Germany, Fab 30 plant. They also share a DDR2 memory controller, which means that if your system has a non-AM2 processor now, you'll need to pick up some DDR2 memory (along with that AM2 motherboard) when you upgrade to either of these processors. Each processor also has 128KB of L1 cache per core, 512KB of L2 cache per core, and a 2,000MHz HyperTransport bus. The processors have different VCore requirements: The 4600+ is rated for 1.20 to 1.25 and the 3800+ requires 1.025 to 1.075.

I tested both processors on an Asus M2NPV-VM, a micro ATX motherboard that includes integrated graphics. My test system included 1GB of Corsair XMS2-8500 1,066MHz DDR-2 memory . For storage, I chose a 74GB Western Digital Raptor WD740 10,000rpm hard drive. A 550W Antec TruePower 2.0 PSU wrapped up the test system.

As energy-efficient as the CPUs are, you can reduce the power drain even further by enabling AMD's Cool'n'Quiet technology, which lowers power consumption when the processor isn't running full-bore. The feature made a noticeable difference when I tested power consumption while the system was idle. If you're really shooting for the lowest wattage you can get, you'll want to enable C'n'Q, but if performance is top priority, you may want to benchmark your favorite applications with and without C'n'Q to make sure it doesn't have a performance impact. In the case of our Dr. DivX and WinRAR tests, the system slowed a little (generally by about 10 to 20 seconds) after I enabled C'n'Q. AMD spokesperson Damon Muzny points out that C'n'Q doesn't impact all applications. This is a minor issue; after all, the processors already pull significantly less power than standard AM2s.

The 3800+ and 4600+ weren't far apart in the performance tests. In PCMark05, the 3800+ scored 3707 and 4600+ scored 4049. Not surprisingly, the integrated graphics produced the lowest component score in PCMark05 and reduced the 3DMark06 scores to the low 200's for both CPUs. However, the 4600+ widened the point gap from 342 to 540 in PCMark05 and took a 207-point lead in 3DMark06 when I plugged a 512MB ATI Radeon X1900 XTX card into the test system.

If you're looking for a low-power chip for a desktop PC, the 4600+ is worth a look. I like both processors (and I can certainly see someone choosing the 3800+ for a media center PC), but I'd lean toward the 4600+ if I were buying a CPU for a media center or an energy-efficient desktop. I really like the balance between low wattage and speed. ▲

by Joshua Gulick

Benchmark Numbers

	PCMark05*	CPU	Memory	Graphics	HDD	3DMark06*
AMD Athlon 64 X2 4600+ EE	4049	4653	3656	1316	6955	206
AMD Athlon 64 X2 4600+ EE & 512MB ATI Radeon X1900 XTX	5919	4607	3722	6891	6920	5780
AMD Athlon 64 3800+ EE/SS	3707	4001	3368	1296	6925	202
AMD Athlon 64 3800+ EE/SS & 512MB ATI Radeon X1900 XTX	5379	4025	3492	6873	6903	5573

* C'n'Q enabled for all PCMark05 and 3DMark06 runs

		Time	Mean Wattage	Time	Mean Wattage
		(C'n'Q enabled)		(C'n'Q disabled)	
AMD Athlon 64 X2 4600+ EE	**Idle**		62W		69W
	Dr. DivX (minutes:seconds)	7:25	101W	6:40	108W
	WinRAR (min:sec)	4:26	98W	4:15	101W
AMD Athlon 64 3800+ EE/SS	**Idle**		59W		63W
	Dr. DivX (min:sec)	8:20	85W	7:59	89W
	WinRAR (min:sec)	4:59	81W	4:41	83W

AMD Athlon 64 X2 3800+ EE/SS
$362
AMD
www.amd.com
● ● ● ◖

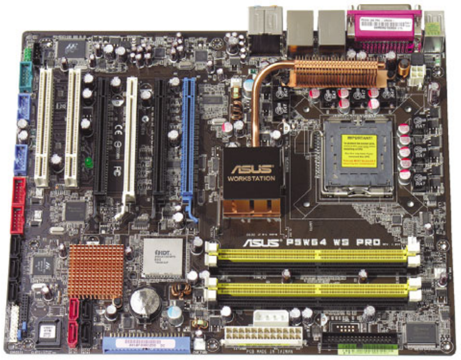
Specs: 2GHz; 128KB L1 cache x2; 512KB L2 cache x2; DDR-2 memory controller; 2GHz HyperTransport Link; Socket AM2; 35W max thermal power; 90nm process

AMD Athlon 64 X2 4600+ EE
$276
AMD
www.amd.com
● ● ● ●

Specs: 2.4GHz; 128KB L1 cache x2; 512KB L2 cache x2; DDR-2 memory controller; 2GHz HyperTransport Link; Socket AM2; 65W max thermal power; 90nm process

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ● ● ◖ **2.5 = ABSOLUTELY AVERAGE** | ● ● ● ● ● **5 = ABSOLUTELY PERFECT**

Asus P5W64 WS Professional



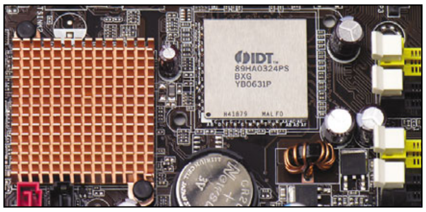
The advent of PCI Express in mainstream computing marked the enablement of an entirely new architecture for connectivity of more powerful co-processor technology. The GPU was the first to take advantage of PCI-E's high-bandwidth, dedicated, serial point-to-point links, and products based on networking, storage, and other important components are slowly but surely following suit.

PCI-E hasn't exactly gone completely mainstream yet for things such as Gigabit Ethernet, RAID, and sound cards, but the writing's on the wall. Eventually we're all going to want more available PCI-E lanes and slots. And though Nvidia recently answered the call with its nForce4 SLI X16 and nForce 590 SLI chipsets for both AMD and Intel platforms, Intel left its die-hard chipset crowd with a mere 22 PCI Express lanes—a single x16 or a pair of x8s for the PEG slots and another six lanes off the southbridge for expansion or integrated PCI-E controllers. This leaves a bit of a hole in Intel's chipset offering. And in the age of the ever-fabulous Core 2 Duo processor, that's a relatively big hole.

Asus identified that hole and is aiming to fill it with its new P5W64 WS motherboard, branded as a "professional" part. The P5W64 WS Professional is based on the Intel 975X chipset but has PCI-E connectivity beyond Intel's 22-lane limitation. In fact, the board has four total x16 PCI-E graphics slots which can be set up, in order from the first to fourth position on the board, in expanded x8, x8, x4, x8 or standard x16, x0, x4, x0 configs. In a nutshell, this board provides another eight available PCI-E lanes for flexible slot expansion.

To achieve this, Asus bolted on a 3-port, 24-lane PCI-E switch to an x8 connection on the 975X northbridge.

The IDT 89HA0324PS PCI-E switch on this board utilizes an X8 link to talk to the northbridge but provides a pair of x8 connections as a "fan out" to downstream devices. So, for that dual-GPU CrossFire setup, you still have the standard dual-x8 PEG connections, but you also gain an additional x8 PCI-E link for another card of your choice. And don't forget the PCI-E x4-enabled link off the southbridge. Physically, all four of these slots are full-length, PCI-E x16-style connectors. The board will also auto-negotiate the appropriate PCI-E connection, as available, for each slot. You can, in fact, run four PCI-E-based graphics cards in each of the four slots, though the card in the third slot would have to drop down to x4 mode. Regardless, eight-monitor support is here, should you have the urge to fully utilize the "Wall Street Quartet," as Asus likes to call them.



Say hello to my little friend! Thanks to the IDT 89HA0324PS switch, the P5W64 WS Professional serves up an extra helping of x8 PCI-E goodness.

With a Core 2 Duo E6700 chip driving the P5W64 WS Pro through our usual lineup of benchmarks, it produced results that were, as expected, impressive. Because the board is akin to Asus' P5W DH motherboard (page 54, Sept. *CPU*) but on workstation steroids, the P5W64 performs almost identically to its lower-cost brethren and overclocks just as well, to boot.

Frankly, the possibilities of the extra PCI-E x8 connection were more interesting to us, so we plugged in a new ARC-1210 PCI-E x8 RAID card from Areca and let the RAID 0 and RAID 5 tests fly. Not only were our RAID numbers impressive, but also the switch didn't hamper CrossFire gaming performance in the least. Though you'll have to think out your strategy for expansion slot population, a CrossFire setup with a PCI Express Hardware RAID controller is a whole ton of fun that the P5W64 WS Professional can deliver. ▲

by Dave Altavilla

Benchmark Numbers

	Asus P5W64 WS	Asus P5WDH	Intel DX975XBX
PCMark05 CPU	6832	6840	6756
PCMark05 Memory	5795	5780	5688
Office XP	480	484	481
Photoshop 7	220	218	220
3DMark06 CPU	2336	2327	2293

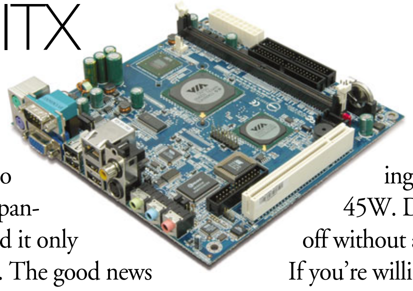
HDTach	ICH7R	w/ ARC-1210 x8 PCI-E RAID
Average Read/WriteMBps		
RAID 0	135/139	154/281
RAID 5	134/11	141/282
Burst Speed MBps		
RAID 0	247	626
RAID 5	233	646

Specs: Max memory: 8GB DDR2-800/667/533; Dual Gigabit Ethernet; IDT 89HA0324 PCI-E switch; Slots: 4 PCI-E x16, 2 PCI

P5W64 WS Professional
$309
Asus
www.asus.com
●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Via Epia CN13000G Mini-ITX



Via's Epia-series motherboards (which have embedded processors) can't compete with high-end desktop systems, but they make up for their lack of processing and graphics oomph with their tiny footprints and low power consumption. Via built the boards to its own Mini-ITX form factor, which is smaller than Micro and Flex ATX form factors. The Via Epia CN measures 6.7 x 6.7 inches and includes an integrated 1.3GHz or 1GHz Via C7 processor (models Epia CN13000G and CN10000EG, respectively).

Despite its small footprint, the CN13000G has a bunch of integrated components, including a 1.3GHz Via C7 processor, a CN700 northbridge, and a VT8237 southbridge. It also has integrated UniChrome Pro graphics and a Via VT1625M HDTV encoder. Other Via chips on the CN13000G include the 10/100Mbps VT6103 LAN and the VT1618 8-channel AC'97 audio codec.

The CN13000G's size forces it to sacrifice some features common to larger boards. Its only expansion slot is a PCI slot, and it only has a single memory slot. The good news is that it supports up to 1GB of DDR2-533. Particularly small mobos sometimes lag behind larger ones in advanced features, so it's good to see DDR2 here. I'm also glad to see that the board includes two SATA connectors, which complement the two ATA 100/133 connectors. However, the CN13000G lacks a floppy drive connector.

Although the system didn't provide stellar benchmark scores (in fact, it spent 44 minutes encoding our test video in the Dr.DivX test), it offered very low wattage, making it ideal for small cases that would suffer heat problems with faster, hotter components. At idle, my test system (which included an 80GB Western Digital 7200 ATA drive, a Plextor PX-708A, and a 400W CoolMax CX-400B) ran at only 39W. It rose during testing, but didn't top 45W. DVD playback tests went off without a hitch.

If you're willing to sacrifice the power you'd get with a large board and faster components, you can build a decent HTPC around the Epia CN13000G. The chipset fan is nearly silent and is probably the only fan you'll need for your system, thanks to the board's low power consumption. ▲

by Joshua Gulick

Benchmark Numbers

	Time (min:sec)	Test System Mean Wattage
Idle		39W
Dr. DivX	44:03	45W
WinRAR	18:13	45W

Specs: 1.3GHz Via C7 nanoBGA2 CPU; Via CN700/ VT8237R chipset; Integrated Via UniChrome Pro AGP graphics; PCI slot; SATA (x2); USB 2.0 (x8); DDR-2 memory slot

Epia CN Mini-ITX
$193
Via
www.via.com.tw
●●●◖

Sony VAIO VGN-TX770P

Thin and light notebooks could scarcely be much thinner and lighter than the Sony TX series. At a mere 2.7 pounds with the regular capacity battery installed and barely an inch thick, this isn't just a road warrior; it's a road samurai. It handles multimedia playback, wireless connectivity, and day-to-day work, all with class.

TX systems sport up to 1.5GB RAM and come with an ultra low-voltage Pentium M 1.3GHz processor, Memory Stick and SD media slots, a built-in dual-layer DVD±RW drive, and an 11.1-inch widescreen Xbrite LCD display, which uses LEDs rather than a fluorescent lamp for its light source, so it's bright without being a battery eater. The TX series also comes billed as "Windows Vista Capable"—it has 128MB onboard graphics memory—and while it doesn't ship with restore DVDs, Sony lets you burn them yourself onto two DVD-Rs at any time.

The VAIO systems aren't known for being speed demons, but the TX put up a respectable 1523 in PCMark05, and the MobileMark test suite clocked 422 minutes of continuous use (a performance rating of 102) with nothing more than the standard battery that ships with the system. I got similarly impressive battery life out of my own regular system use; when using the DVD drive, I squeezed out a little less than four hours of playback time. The only noise in the system comes from the left-side-venting CPU exhaust fan, but you can use the TX's power-management controls to throttle down the fan.

Two other features make the TX stand out. The first is Instant Mode, wherein the laptop works like a standalone CD/DVD player without booting into Windows. The other is built-in cellular Wireless WAN access; starting at about $49 a month, you can use Cingular's network for data and surfing if you're often without Wi-Fi access. The external antenna, which folds down automatically when you close the lid, gave me excellent connectivity for all services, and an external switch lets you turn off wireless when it's not in use. ▲

by Serdar Yegulalp

Specs: Intel 1.3GHz ultra low-voltage Pentium M; Intel 915GMS; 4,200rpm 80GB HDD; Integrated WWAN

VAIO VGN-TX770P
From $2,049.99
Sony
www.sony.com/tx
●●●●◖

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

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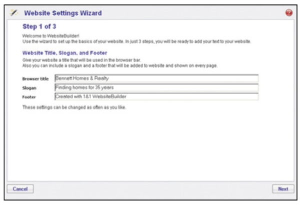

Website Settings Wizard

Step 1 of 3

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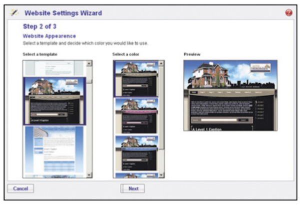
Website Title, Slogan, and Footer

Give your website a title that will be used in the browser bar.
Also you can include a slogan and a footer that will be added to website and shown on every page.

Browser title: Bennett Homes & Realty
Slogan: Finding homes for 35 years
Footer: Created with 1&1 WebsiteBuilder

These settings can be changed as often as you like.

2 Choose your layout



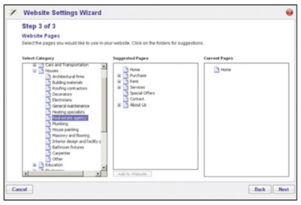
Website Settings Wizard

Step 2 of 3

Website Appearence

Select a template and decide which color you would like to use.

3 Add pages



Website Settings Wizard

Step 3 of 3

Website Pages

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E-mail Accounts	**1,000 IMAP or POP3**	200 POP3	1,000 POP3
Mailbox Size	**2 GB**	2 GB	10 MB
RSS Feed Creator	✓	–	$4.99/month
Blog	✓	✓	$2.99/mo. for ad-free blogs
Search Engine Submission	✓	✓	$29.99/year for submission and optimization
Search Engine Optimization	**90-Day Trial**	90-Day Trial	
Geographic Map	✓	✓	–
Website Builder	**12 Pages**	✓	Freeware
Flash Site Builder	**12 Pages**	–	–
Photo Gallery	✓	✓	✓
Dynamic Web Content	✓	✓	–
Chat Channels	✓	–	✓
Starter Software Suite	✓	–	–
90-Day Money Back Guarantee	✓	–	–
Support	**24/7 Toll-free Phone, E-mail**	24/7 Toll-free Phone, E-mail	24/7 Phone, E-mail
Price Per Month	**$4.99**	**$11.95**	**$6.99**
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Evga e-GeForce 7950 GX2

Unlike many of the other 7950 GX2 reviews out there in which the writer has access to $2,000 30-inch monitors and the like, I set out on a more modest budget. I was hoping to find out what Quad SLI had in store for the average user like myself, armed with a decent flat-screen monitor capable of resolutions only as high as 1,600 x 1,200, a setting that even today I doubt many users are currently playing at. My test system included a Gigabyte GA-8N-SLI Quad Royal board (nForce4 SLI X16), an Intel Pentium 4 650 CPU, 2GB of Corsair XMS DDR2, and two Western Digital SE16 hard drives configured in RAID 0.

Testing consisted of running benchmarks in newer games such as F.E.A.R. and Quake 4, as well as that old standby, 3DMark06. These tests included a run with a single 7950 GX2 to set the playing level, then again with a Quad SLI setup both with and without anti-aliasing and Anisotropic filtering enabled. A final run was done with an AA setting only found with Quad SLI configurations using the latest ForceWare drivers, dubbed 32x SLI-AA.

Standard scores posed an interesting question, as Quad SLI actually ran slightly slower than a single 7950 GX2 at 1,600 x 1,200 without any optimizations. Cranking up the settings, however, shows what an extra set of GPUs is capable of, although the 32x SLI-AA numbers were disappointing. While the price range may keep all but a fraction of the gamers away, there is ample evidence that just such a setup will provide the best gaming experience on the PC, even when played at "lower" resolutions such as 1,600 x 1,200. ▲

by Robert Maloney

e-GeForce 7950 GX2
$599.99
Evga
www.evga.com
●●●●

Specs: Dual GeForce 7950 GPUs, 500MHz core speed, 1GB DDR3 DRAM at 600MHz (1.2GHz effective, 512MB per GPU), PCI-E x16, 48 pixel pipelines, 76.8GBps memory bandwidth

Benchmark Numbers

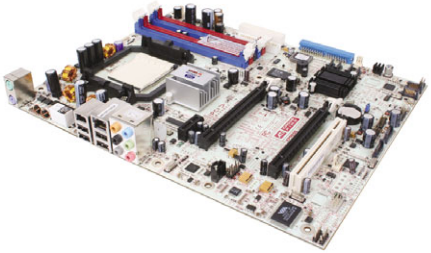
	7950 GX2	GX2 (AA)	Quad SLI	Quad (AA)	Quad (32x SLI-AA)
FEAR 1.0.7	90	29	88	49	15
X3:Reunion	50.14	39.01	49.05	46.82	23.19
QUAKE4 1.2	80.6	38.3	78.7	65.5	18.4
3DMARK06	5542		5520		
SM2	2571		2502		
HDR	2963		2921		

Sapphire PC-AM2RD580

If you've ever played darts with someone who inexplicably hits nothing but bull's-eyes and Sheetrock behind the dartboard, then you'll be ready for the PC-AM2RD580, one of two recently released CrossFire Xpress 3200-based motherboards from Sapphire. Simply stated, it's hit and miss.

Take one look at the board layout, and you'll see that from a design standpoint the PC-AM2RD580's motto is "CrossFire or bust." The PCI Express x16 slots are spaced far enough apart to add a water-cooling system, but you'll have to sacrifice the motherboard's sole legacy PCI slot. The only other expansion slot, an x1 connector, occupies a tenuous position on the board between the northbridge heatsink and the top x16 connector.

I liked that the PC-AM2RD580 sports a Socket AM2, and ATI's relatively new SB600 southbridge looks sharp with SATA II support and Gigabit Ethernet.



But the board's 4GB maximum memory support leaves a little to be desired. Vista will be a memory hog, and I think MSI's K9A Platinum may be better equipped for the future.

The PC-AM2RD580 did show it could stand toe to toe with other AM2 motherboards. I dropped in a 2.8GHz Athlon 64 FX-62, 2GB DDR2-800 RAM, and an ATI Radeon X1950 XTX and let the benchmarks fly. The motherboard crunched our 500MB test folder with WinRAR 3.51 in 3:22 (minutes: seconds), a full 15 seconds faster than Foxconn's C51XEM2AA. The PC-AM2RD580 ripped through the same folder with WinRAR 3.6 in 2:23 and posted an overall score of 6731 in PCMark05.

Sapphire includes plenty of overclocking options in the motherboard's BIOS, which should please those who want to push their CrossFire systems to the limit. With a little design improvement and more expansion options, the PC-AM2RD580 would've been right on target. ▲

by Vince Cogley

PC-AM2RD580
$200 (approx.)
Sapphire
www.sapphiretech.com/us
●●●

The Numbers

PCMark05	
Overall	6731
CPU	5712
Memory	5130
Graphics	7315
HDD	6230
WinRAR 3.6 (minutes:seconds)	2:23
WinRAR 3.51 (min:sec)	3:22
F.E.A.R. 640 x 480 - low quality	278

Specs: Socket AM2; CrossFire Xpress 3200 northbridge; Max memory: 4GB DDR2; Slots: 2 PCI-E x16; 1 PCI-E x1; 1 PCI

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Corsair TWIN2X2048-8888C4DF

Over the better part of the last decade, just about every component used in a typical PC has undergone a major transformation. Video cards have become infinitely more powerful, motherboards now have a host of integrated peripherals that used to reside on expansion cards, and CPU coolers have morphed into funky-shaped contraptions that are barely recognizable next to the blocky heatsink-and-fan combos of old. But lay a 10-year-old DIMM alongside one from today, though, and to the untrained eye, they may very well look like they came fresh off the same assembly line.

However, Corsair's latest memory kit, the Dominator, looks like nothing else currently available and performs in a class of its own, thanks to some patent pending technology. Corsair has taken the PCB used in its excellent 6400C3 kit, extended it upward, and connected conductive traces to the ground-plane. These traces lead to conductive pads on the upper portion of the PCB that Corsair outfitted with aluminum heatsinks to help draw heat out of the board. The memory chips themselves are also adorned with heatsinks that offer more surface area than previous designs.

Corsair calls the combined tweaked PCB and multiple heatsinks its DHX (Dual-path Heat Xchange) technology. With DHX, in addition to some selective binning and an included fan assembly for active cooling, Corsair rates the Dominator kit for PC2-8888 speeds with 4-4-4-12-2T timings at 2.4V.

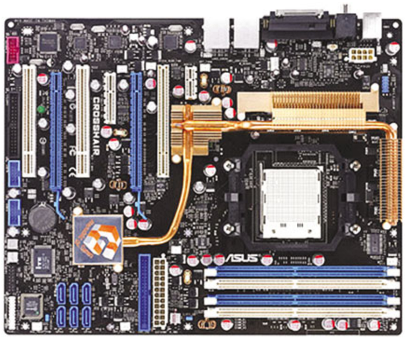
I took the TWIN2X2048-8888C4DF kit to task using an Athlon 64 X2 5000+, a GeForce 7900 GTX, and an Asus nForce 590 SLI motherboard, and found that it performed exceptionally well. With the TWIN2X2048-8888C4DF kit installed, my test system put up over 190fps in F.E.A.R. at the game's lowest-quality settings, and it managed more than 7.6GBps in Sandra's buffered memory benchmark when running at 800MHz. With the memory running close to its rated speed of 1,111MHz, however, F.E.A.R.'s frame rate jumped over 210fps, and Sandra reported over 10.8GBps available bandwidth. At almost 600 bucks, this memory kit is pricey, but there's nothing else on the market that can touch its performance. ▲

by Marco Chiappetta

Specs: Capacity: 2,048MB (1,024MB x 2); Latencies: 4 (CAS), 4 (RAS Precharge), 4 (RAS to CAS), 12 (RAS Activate to Precharge), 2T (Command Rate); Voltage: 2.4V; lifetime warranty

TWIN2X2048-8888C4DF
$599
Corsair
www.corsairmicro.com
●●●●

Asus CrossHair



The Asus M2N32-SLI Deluxe was arguably the best-appointed Socket AM2 motherboard in our recent roundup. The board exploits all of its nForce 590 SLI chipset's features and incorporates a number of additional integrated peripherals to further enhance its spec sheet. Asus must not have been content with the M2N32-SLI Deluxe, though, and has since introduced the CrossHair, the first member of its new "Republic of Gamers" line of decked-out motherboards.

Like the M2N32-SLI, the CrossHair relies on the nForce 590 SLI chipset. And it has all of the goodies enthusiasts crave, such as SLI support, RAID, HD audio, dual-Gigabit LAN, and an overclocker-friendly BIOS. But the board also sports an 8-phase EL-Capless power design, silent heatpipe cooling, and handy on-board power, reset, and clear-CMOS switches. In addition to these items, the CrossHair is equipped with an electroluminescent I/O cluster, about a dozen LEDs to light a system's internals, and a backlit LCD POST code error reporter.

With a pair of GeForce 7900 GTXs, a gig of RAM, and an Athlon 64 5000+ installed, the Asus CrossHair put up 83fps in the F.E.A.R. benchmark and 110.4fps in Quake 4 at 1,600 x 1,200 with 4XAA and 16X aniso enabled. The CrossHair also tore through the multithreaded Cinebench and LAME MT MP3 encoding tests in 38 and 50 seconds, respectively.

Because Asus has packed so much stuff onto it, the CrossHair's layout is a bit cramped. But this motherboard does just about everything well and it'd make for an excellent foundation to a high-end, AMD-powered rig. ▲

by Marco Chiappetta

Specs: Socket AM2; Chipset: nForce 590 SLI; Max Memory: 8GB; Audio: ADI1988B, 8-channel; LAN: Dual Gigabit (nForce MAC, Marvell PHY); Slots: 2 PCI-E x16, 1 PCI-E x4, 3 PCI, 1 proprietary audio

CrossHair
$240
Asus
www.asus.com
●●●◖

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●◖ 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

XFX GeForce 7900 GS 480M XT

All things considered, XFX's GeForce 7900 GS is equal parts ho hum and hot diggity. It joins the GeForce 7950 GX2, 7900 GTX, 7900 GT, and recently announced 7950 GT to bring Nvidia's high-end GPUs to more affordable territory. Of course, Nvidia had the same M.O. with 6800 and 7800 families, so the GeForce 7900 GS doesn't come as a surprise.

The GeForce 7900 GS is essentially a GeForce 7900 GT with slightly crippled specs. It sacrifices a few pixel shaders (four fewer than the 7900 GT's 24) and a vertex shader (seven to the 7900 GT's eight).

But XFX not only puts its own cosmetic touch on its GeForce 7900 GS 480M XT, but also it gives the GPU and memory clocks a slight nudge above Nvidia's standard 7900 GS. The neon-green fan and DVI ports stand out on the card's black PCB and heatsink shroud. And with a 480MHz core and 700MHz memory clock, the card has a slight advantage over the stock's 450MHz core and 660MHz memory clocks.

When you consider the GeForce 7950 GX2's core and memory clock speeds are 500MHz and 600MHz, respectively, it's tempting to draw the conclusion that Nvidia simply sliced a 7950 GX2 in half and sent it out the door as two 7900 GSes. My tests with the GeForce 7900 GS 480M XT revealed that this isn't too far from the truth. Although I only tested a single card, two 7900 GSes in SLI should theoretically give a 7950 GX2 a run for its money.

And at $219 a card, that's when SLI makes sense. ▲

by Vince Cogley

GeForce 7900 GS 480M XT
$219
XFX
www.xfxforce.com
●●●●◖

Specs: GPU: GeForce 7900 GS; GPU clock: 480MHz; Memory: 256MB (700MHz); dual-DVI outputs

	XFX GeForce 7900 GS 480M XT	XFX GeForce 7950 GX2
3DMark06		
Overall	4656	8670
SM2.0	1785	3800
HDR/SM3.0	1775	3665
CPU	2524	2476
F.E.A.R. 1.07		
1,600 x 1,200 4XAA/8XAF	36	7
Quake 4 1.2		
1,600 x 1,200 4XAA/8XAF	49.51	97
Oblivion		
1,600 x 1,200 HDR, 16XAF		
Indoor	32	58.6
Outdoor	21.1	38.4

XFX GeForce 7950 GT

Giant, whirling blades are terrific for things such as helicopters, hovercrafts, and that giant fan your frugal grandma Mabel uses to keep her kitchen cool in the summer, but even most newbies know that rapidly spinning fans keep your components from overheating at a cost—excess noise. Manufacturers have experimented with fan size and variable speed controls, but the simple fact remains that if it's moving, it's making a ruckus.

XFX plucks the fan from its GeForce 7950 GT 570M Extreme, opting for a passive-cooling heatsink that gives Intel and AMD's stock heatsinks a run for their money. As a result, XFX delivers a card with screaming performance that doesn't scream back.

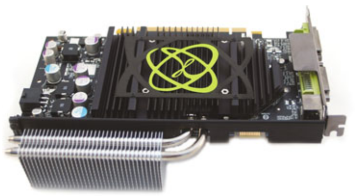
With a 570MHz core clock and 750MHz memory clock, the card is a little zestier than Nvidia's reference GeForce 7950 GT but not quite as spicy as the GeForce 7900 GTX. XFX managed to preserve the single-slot reference design by wrapping the ginormous heatsink fins around to the back of the PCB; it came close to but still left some breathing room for my motherboard's, an Intel D975XBX, northbridge heatsink, and DIMM slots.

The retail bundle itself is worth noting, if only to mention that it includes a copy of Tom Clancy's Ghost Recon Advanced Warfighter. GRAW is far from extinct, so it's nice to have something that can push the GeForce 7950 GT 570M Extreme's abilities right out of the box.

I tested the card in a rig with Intel's Core 2 Duo Extreme X6800 CPU and 2GB Corsair DDR2-800 memory and sent it through the buffet line for a full plate of benchmarks. Although it ran F.E.A.R. and Quake 4 without much difficulty, rendering Oblivion's lush outdoor environs with HDR and 16X ansio enable is probably too much for the GeForce 7950 GT Extreme without SLI. ▲

by Vince Cogley

3DMark06	
Overall	5569
SM2.0	2202
HDR/SM3.0	2174
CPU	2485
F.E.A.R. 1.07	
1,600 x 1,200 4XAA/8XAF	43
Quake 4	
1,600 x 1,200 4XAA/8XAF	59.28
Oblivion	
1,600 x 1,200 HDR/16XAF	
Indoor	40.1
Outdoor	28.3



GeForce 7950 GT 570M Extreme
$319
XFX
www.xfxforce.com
●●●◖

Specs: GPU: GeForce 7950GT; Core clock: 570MHz; Memory: 512MB (700MHz); passive cooling

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◖ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

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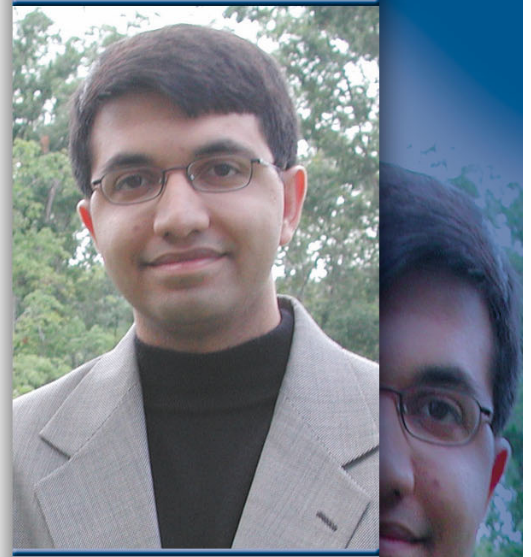
Fully Buffered DIMMs Explained

by Anand Lal Shimpi



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, *CBS' "48 Hours" and* Fortune. *His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.*

Last month I talked about the Mac Pro and promised to talk about FB-DIMMs, so here we are.

Late in the Pentium III's life, Intel decided that it was time to switch to a new memory technology. The market was beginning its transition away from conventional SDRAM and was about to embrace DDR SDRAM, but Intel attempted to change the market's desires by introducing a radical departure from SDRAM in the form of Rambus DRAM.

Thanks to its serial interface, RDRAM operated at much higher clock speeds than SDRAM/DDR SDRAM while offering much higher bandwidth per pin than its parallel counterparts. In a bandwidth-hungry world, RDRAM would have put its competitors to shame. The Pentium III, however, simply didn't need that much bandwidth. All users saw in RDRAM was an incredible price premium and lower performance thanks to its inherently higher latency.

Intel did its best to force RDRAM on the market anyway. To be fair, the benefits of RDRAM were considerable: It had many fewer signaling pins, which made routing easier and also allowed the use of more memory channels. The demand for memory bandwidth would eventually increase tremendously (as we can see today by the needs of a single-socket, quad-core CPU), and Intel wanted to be ahead of the curve. RDRAM did so, but ultimately failed as the market would not justify spending so much on memory that offered no immediate, tangible performance increase. Getting someone to spend five times as much on memory today in order to prepare for bandwidth needs years down the line is hardly an easy sell.

With RDRAM a catastrophic failure, Intel stopped trying to shape the direction of memory technologies for a few years. The aftermath of RDRAM's failure on the desktop had seen Via propelled to leadership in the chipset market as its SDRAM/DDR SDRAM products became even more highly sought after, while Intel's exclusive RDRAM offerings had become largely undesirable.

Recently, Intel has again tried its hand at shaping the future of the DRAM industry, but this time the focus is on the high-end workstation and server markets. The basic goal is the same—to increase bandwidth per pin and reduce pin count—but this time there's an additional emphasis on capacity. Capacity is crucial in the enterprise market, and unfortunately with current memory technologies as speed goes up, the number of modules you can install per channel goes down; Intel's solution to this problem comes in the form of FBD (Fully Buffered DIMM) technology.

Intel has clearly learned from its RDRAM missteps. FBD uses normal DDR2 (and eventually DDR3) devices, so costs won't be that much higher than those of normal DDR2 modules. What separates FBD from regular DDR2 is a chip on each module called the AMB (Advanced Memory Buffer), which buffers all data/address/command requests to the DRAM devices—hence the name "Fully Buffered DIMM." Buffering them lets you have up to eight FB-DIMMs per channel.

The AMB also acts as a translator; one side communicates with parallel DDR2 devices, while the other has a high-speed serial interface that communicates between AMBs and the memory controller. This aspect of the AMB's role allows Intel to have its serial interface while still interfacing to commodity DDR2 DRAM, effectively giving it the best of both worlds.

Unfortunately, the AMB is a drain on performance. As you can guess, high-speed translation always comes with a penalty, and thus latency is higher with FBD than conventional DDR2 memory. The latency penalty will keep FBD from becoming a desktop standard, and it may end up killing it in the enterprise market down the road. The best overall solution is still going to be a native serial memory architecture, as the performance loss at the AMB is significant.

The upshot of all this is that because all Intel server/workstation chipsets require FBD, Apple is stuck using FB-DIMMs as long as it wants to have two sockets, as in the Mac Pro. ▲

> In a bandwidth-hungry world, RDRAM would have put its competitors to shame; the Pentium III, however, simply didn't need that much bandwidth.

Talk back to Anand at anand@cpumag.com.

by Alex “Sharky” Ross

Intel Turns The Mobile Screw

AMD and Intel have been duking it out for some time now on the desktop side with some back and forth over the years. However, on the mobile side of the fence things have been very different. AMD has never garnered much of a market share (around 15% or so currently) and its current Turion 64 looks more like a middleweight taking on Intel’s heavyweight mobile chip. The latest Intel Core 2 release (dubbed Merom) for the mobile sector is only going to further stamp Intel’s lead in the arena.

Intel’s previous mobile Core Duo Centrino setup consisted of a pair of Dothan (Pentium M) cores running in tandem, sucking up more power as a result. The Merom CPU is based upon Intel’s 0.65-micron process and has the same core architecture as the Core 2 Duo desktop. The mobile version, though, will debut with 1.66 to 2.33GHz speeds and have up to 4MB worth of on-chip L2 cache utilizing a quad-pumped 667MHz front-side bus. This additional cache also offers improvements in both latency and bandwidth because it’s now on the chip. The Socket 479 PGA packaging for the mobile version of Core 2 Duo is obviously different (it has to be to fit a mobile platform’s needs), but otherwise on the surface everything seems to be almost the same—besides the now 291 million transistors all jam-packed into an ever-larger 143mm^2 die size. The major difference is the most important one: power savings. Conroe chips operate at 1.3 volts on the desktop, but on the mobile side Intel was able to reduce that down to 1.1 volts for the Merom. Tackling power saving is clearly key on laptops, where battery life is so important.

Other than the obvious dual-core architecture benefits in terms of performance, the technology also sports Intel’s Wide Dynamic Execution for accelerated multiple-threaded applications. In the past Intel architectures ran on three instructions per clock, but with the Merom CPU not only can it do the same tasks with four instructions per clock, but with Intel’s macro-fusion technology it will actually be capable of performing up to five instructions per clock.

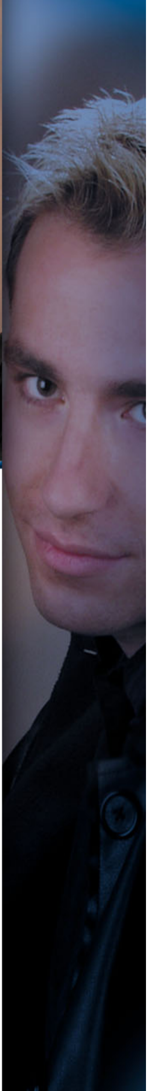
Intel’s Merom mobile chip also has Advanced Smart Cache, which now has the benefits of 4MB L2 shared cache compared to 2MB L2 on the Core Duo (Dothan) processor. This chip also supports Advanced Digital Media Boost, providing a boost in the number of SSE calculations per clock and supposedly by doubling the streaming media compute throughput in comparison to the previous generation Intel Core Duo. Intel also adds 64-bit extensions for Vista and the like.

Speaking of the original Core Duo, if you happen to have one and a Mobile 945 Express chipset, you can simply upgrade it with a T7*xx* or T5*xx* processor along with a BIOS update, which is certainly cheaper than buying another new laptop. Throw in less power consumption, greater battery life, and more performance, and Intel has a very attractive upgrade on offer with the Merom core.

With the AMD/ATI merger there could yet be some interesting developments, but nothing can come soon enough on the mobile side for AMD. The Turion 64 X2 is as good as it gets for AMD currently on a notebook, and that’s assuming that you can find one. Once you take into account that a single-core Turion’s performance falls somewhat short of Intel’s outgoing single-core Pentium M chip, AMD’s offerings are even less attractive now than in the past.

By the time you read this, Dell will already be shipping its Windows XP-based systems with Intel mobile Core 2 Duo processors. Intel will launch a total of five processors ranging from the $637 T7600 clocked at 2.33GHz with the full complement of 4MB L2 cache down to the $209 T5500 clocked at 1.66GHz with only 2MB of L2 cache. For us “mobile” gamers, a T7600 paired with an Nvidia Geforce 7900 Go or ATI X1800 is certainly an appetizing thought. ▲

Email me at sharky@cpumag.com



Disrupting Reuters’ newswire with a cheery Christmas greeting at age six, Alex “Sharky” Ross became an avid computer user/abuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overclocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he’s not tweaking PCs.

The latest Intel Core 2 release (dubbed Merom) for the mobile sector is only going to further stamp Intel’s lead in the arena.

PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Modding enthusiasts have a penchant for the latest toys. Fast processors, powerful video cards, silent SFF enclosures, and radically lit motherboards are all fair game when it comes to a modder's creative mind. Recognizing the appeal of unconventional customization, an entire industry has emerged to support the community.

Mods & Ends

Icy Dock Modiflash 722

Users looking for the convenience and security of a removable hard drive and want to add a bit of personality to their rigs should consider one of Icy Dock's Modiflash 722 removable hard drive enclosures ($37.99). The Modiflash 722 is compatible with any standard 3.5-inch SATA hard drive and fits into any 5.25-inch drive bay. It features a 2-inch, backlit LCD that scrolls temperature and other data about the hard drive and a three-way power control key that either locks the drive in place (with or without power) or unlocks the drive cage for removal.

The Modiflash 722's body is almost entirely aluminum, and when you remove the drive cage from the bay, a dust cover flips down to protect the system's internals. But what's probably the most exciting feature is a replaceable electroluminescent insert that lights up with different colors and patterns. As of now, four inserts are available, but with the right paints and some creativity, we're sure some of you can come up with your own designs.

Icy Dock's Modiflash 722 is as "mod-friendly" a removable drive enclosure as we've seen.

Thermaltake Purepower Power Express 250W

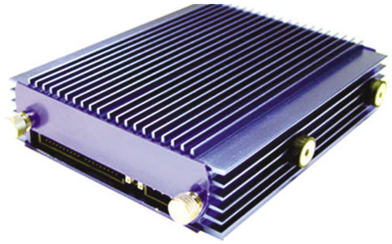
In today's world of multi-GPU graphics card configurations, power is at a premium in a typical gaming PC. To aid the situation, the folks at Thermaltake have released a unique power supply designed to feed a pair of graphics cards alone, eliminating the need to replace the system's PSU in the event of a major graphics upgrade.

Dedicate a power supply to your graphics cards with Thermaltake's Purepower Power Express 250W PSU.

The Purepower Power Express 250W ($50) is available in two models, the W0099RU for SLI configurations and the W0130RU for CrossFire setups. The PSU fits into a standard 5.25-inch drive bay and features two 6-pin PCI-Express connectors that feed the graphics cards. The Purepower Power Express 250W works with a system's main power supply, but has its own power cable that runs into a system through a hole in an expansion slot bracket to receive juice. The front of the unit has three LEDs that indicate the power status for the PSU itself and each of its 12V rails.

Logisys Aluminum Hard Drive Silencer

Noise and heat are two things that the modding community universally hates, but Logisys' Aluminum Hard Drive Silencer (in silver or blue) reduces both. According to its specifications, the Silencer ($37.99) reduces hard drive noise by over 95% by encasing the drive in what is essentially a large heatsink, lowering the hard drive's temperature. It also uses rubber grommets that dampen vibrations from the hard drive to reduce noise. The unit is compatible with all 3.5-inch hard drives (10,000rpm or less), regardless of the interface and fits into a standard 5.25-inch drive bay. It doesn't work with cases that require mounting rails.



The Logisys Aluminum Hard Drive Enclosure keeps hard drives quiet and cool.

Fashionably Fresh Firmware

Pentax K100D (v1.01)

A firmware update for the Pentax K100D digital SLR adds support for SDHC cards with capacities greater than 4GB. It also fixes a problem in Photo Browser 3 to accurately display the focal length input in the Shake Reduction menu.

www.pentax.com

Sony PSP (v2.81)

Sony recently released new firmware for the PSP that addresses a security vulnerability and removes the 4GB Memory Stick limit on the system, among other fixes.

www.us.playstation.com

LiteOn SOHR-5239S (v2S0B)

An update for the LiteOn SOHR-5239S burner improves read and write quality on a number of different types of media.

www.liteonit.com

by Marco Chiappetta

The Modder's Toolkit

Essentials For The Enterprising Modder

With the holidays rapidly approaching, we thought we'd take a break from modding this month and instead give you a peek into the tools and products that make many of the mods we've published in the past possible. There is a core group of tools that every enterprising modder should have at his disposal to make performing many mods easier and potentially even more fun. And, of course, using the right tool for the job always makes the final results better; just ask anyone who has ever tried to pound in a nail with a screwdriver or tighten a screw with a butter knife.

Computer Toolkit

Let's get the obvious items out of the way first. Every PC modder needs to have a computer-centric toolkit on hand, complete with an assortment of screwdrivers, pliers, and grabbing tools such as tweezers and tongs for rescuing screws that fall into tight spots. Do yourself a favor and stop relying on a nearby junk drawer that holds commonly used tools. Having an organized computer toolkit available will make you more efficient and make the modding process easier. And because the individual tools will be demagnetized, they're safe to use around hard drives and other magnetic media. Many computer toolkits are available online at prices ranging from $10 to hundreds of dollars, depending on the number of pieces in the kit.

Staples such as a multitip screwdriver, pliers, tweezers, and wire cutters are a must for anyone working on a PC, let alone a hardcore modder.

Multimeter & PSU Tester

Few things are more frustrating than spending the better part of a day building a new, custom rig, only to have it fail to power up the first time you press the power button. Before starting any build or mod, use a PSU tester or multimeter to ensure that the power supply is functioning properly and that the connections you made are solid. A multimeter is also a necessity for any type of volt mod that requires checking voltages, continuity, and resistance. Taking a few moments to check your work with a multimeter could be the difference between a successful mod and a fried component. There's no way we could have properly performed the GeForce 7900 GT mod in the August issue (see page 32 of the Aug. 2006 *CPU*) without using a multimeter. Multimeters and PSU testers sell at a wide range of prices, but basic, more affordable models are usually fine for most projects. We'd recommend a digital multimeter because it's easier to get a precise reading from one, but analog meters also work.

A multimeter is a required tool for checking voltages, resistance, and continuity. Don't perform any volt-mods without one.

Infrared Thermometer

Many of the most common mods bolster a system's cooling performance to enhance its overclockability or stability. But oftentimes the cooled component doesn't have any built-in hardware monitoring functionality, which can make testing the effectiveness of the mod somewhat difficult. For occasions like this, there is no tool better than an infrared thermometer gun. Simply point the gun at anything, and it'll report the temperature of the target's surface. Infrared thermometer guns, which are typically available for about $50, are especially handy for checking the temperature of passively cooled components, such as the voltage regulator modules and the chipset heatsinks used on many motherboards.

To quickly gauge the temperature of a component that does not have any hardware monitoring, we use an infrared thermometer gun.

Thermal Interface Materials

To keep costs down, most manufacturers use thermal pads or similar products as the thermal interface materials between hot-running chips and their heatsinks. Sometimes, eliminating these inferior pads and replacing them with a quality thermal paste can lower operating temperatures, which in turn increases performance and reliability. Not all thermal interface materials are created equal, however.

We actually keep three different types of TIMs on hand—electrically conductive thermal paste, non-conductive thermal paste, and a thermal epoxy. Conductive paste typically offers the best performance, but it shouldn't be used near exposed traces or surface-mounted components because it could ooze and potentially cause a short circuit. In those situations, use non-conductive paste. And thermal epoxy is handy for permanently mounting heatsinks when there is no other way to securely fasten them in place.

Miscellaneous Heatsinks

As we've already mentioned, modders design many of their most common mods to enhance a system's cooling performance. To achieve that goal, it's sometimes useful to mount heatsinks to chips or components that wouldn't normally have one, such as a clock generator, FET (field-effect transistor), or southbridge, for example. Recycling heatsinks from all manner of cannibalized motherboards or aged video cards is a great way to amass a pile of heatsinks for use in various mods, but you can also buy them from many online retailers. Old Pentium or 486 heatsinks work well in many situations, and RAMsinks fit well on smaller components such as MOSFETs or Vregs.

Twisting wires and covering them in electrical tape is for hacks. Make those connections permanent with a soldering iron and cover them with heat-shrink tubing for safety.

Soldering Tools & Heat-Shrink Tubing

One of the most common mistakes new modders tend to make is improperly connecting wires or electronic components. All of us, at one point or another, have stripped a couple of wires, twisted them together, and wrapped them in black electrical tape, but that's just not good enough in the vast majority of situations. The heat generated in a typical system is usually enough to unstick black electrical tape, and twisted wires can generate electrical noise because of small field effect transmissions in the tiny gaps between the wires. Plus, just try connecting a surface-mount potentiometer to a trace wire for a volt mod and you'll quickly agree that a soldering iron is a necessity for mods that require making electrical connections.

In fact, we'd actually recommend having more than one soldering iron on hand. A basic soldering pen is fine for smaller projects, but a heavy-duty soldering gun works much faster for larger jobs that involve heavier-gauge wires, such as those found on power supplies. Fortunately, soldering irons are relatively inexpensive: You can purchase them for less than $25 online or at any electronics shop.

And consider an assortment of heat-shrink tubing, a required accessory for any solder project that involves connecting wires, as well. Heat-shrink tubing is cheap and it's much better than electrical tape for covering exposed solder connections. It's available in a variety of sizes and colors, so it'll work well for just about any application and look better than a glob of electrical tape. Simply slide a piece of heat-shrink tubing over the wire being soldered, make the solder connection, and then slide the tubing over the joint. Shrink it down with a heat gun or torch and you're done. It makes for a much cleaner final product that won't deteriorate over time.

Rotary Tool

The one tool that has been crucial to the success of more mods than we care to count is the Dremel rotary tool. Thanks to its compact size, ease of use, and myriad attachments and accessories, a rotary tool can be used for countless projects. We've used a rotary tool in virtually every mod we've published in the last few years that has required precision drilling, grinding, or polishing. Attach a cutting wheel to a rotary tool, and it will cut a case's side panel like a hot knife through warm butter. Then, replace the cutting wheel with a sanding wheel to smooth the edges. You can also use a rotary tool as a drill for smaller projects or a grinder for shaping plastics or metal.

The hundreds of different tips available for rotary tools make them suitable for a multitude of projects. Without one in your toolbox, you're doing yourself a major

A Dremel rotary tool is incredibly useful for smaller cutting, grinding, and drilling projects that require a high level of precision.

disservice. Pick one up online or at a local hardware store ($30 to $200 depending on the number of pieces in the kit) and start modding. Once you use one, you'll wonder how you ever got along without it.

A Drill & Hole Saws

For larger projects where a rotary tool is a bit too light-duty, a good drill with an assortment of bits and hole saws is vital. We use a drill anytime we need to make pilot holes in heavier materials and attach a hole saw whenever we need to cut larger, perfect circles. In several past mods, we've used different-sized hole saws to make custom fan mounts or to quickly remove large amounts of material from a case's side panel before whipping out the rotary tool and finishing the job. Generally, higher-voltage cordless drills are the most powerful, but they are also the most expensive.

You can't make clean pilot holes or custom fan mounts without a good drill—preferably a cordless model for convenience.

Sandpapers & Polish

Anytime we set out to overclock a processor or graphics card and don't want to use some sort of exotic cooling solution, we like to lap and polish the processor's IHS (integrated heat spreader) and the base of our heatsink to ensure it's making perfect contact. The flatter and smoother their surfaces, the better the two components will mate, which aids in heat transfer. To make sure we always have the required tools to lap and polish a heatsink or IHS, we always keep an assortment of sandpapers and a wadding metal polish on hand. As we've explained in past articles, to lap a heatsink, you need to start with a coarse grain paper (600 grit) and gradually work your way to a finer grain paper (2,000 grit) to remove larger peaks and valleys from the metal. Then use the wadding polish to finally give the metal a shiny, mirror-like finish. Sandpapers and wadding metal polish are inexpensive. You can be purchase them at any hardware or auto parts store for a few dollars.

Miscellaneous Bits & Pieces

A few other items that come in handy when modding are bootable floppy disks and USB thumb drives, a Linux Live! CD, and an old PCI video card. We commonly use bootable floppy disks, USB thumb drives, and Live! CDs for flashing motherboard or video card BIOS images or for modifying files that are normally inaccessible when Windows is running. And the old PCI video card comes into play should we damage another card while flashing its BIOS. If a video card stops working because of a bad flash, the PCI video card can be used to restore the damaged card back to its original state.

To recover from a bad flash, remove the damaged card, insert the PCI-based video card into a free slot, and connect a monitor to it. Then, power up the system and enter the BIOS. Under the PCI/PnP menu, there will be an option labeled "Init Display First" (or something similar). Change this option so that that system will initialize the PCI video card first, save the changes, and power down the system. Now, reinstall the damaged card, and with the monitor still connected to the PCI card, boot to a floppy and reflash the damaged one with its original BIOS. It's as simple as that.

There are a multitude of other tools and gadgets that hardcore modders around the world use, but if you're looking to put together your own "Modder's Toolkit," the items we've covered here make an excellent foundation. Be safe and happy modding! ▲

by Marco Chiappetta

Having an assortment of hole saws on hand makes it quick and easy to cut perfect circles in almost any material.

Mad Reader MOD

Solar Storm Lights Up The Room

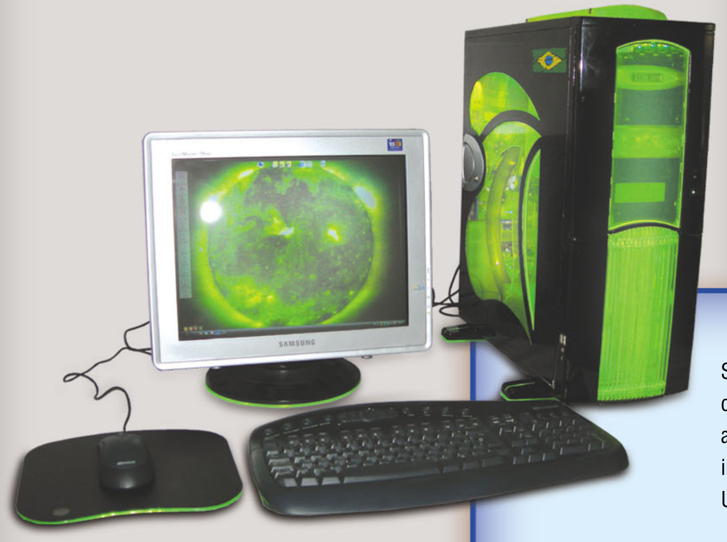
Hailing from Rio de Janeiro, Brazil, Agathyrno "ASGNETO" Neto has six years of experience modding PCs, and it shows in his latest piece. He started Solar Storm by ordering a large vinyl print of a picture he found on NASA's SOHO (Solar and Heliospheric Observatory) Web site (sohowww.nascom.nasa.gov). He then extended the theme to the rest of the computer by applying a black paint job and adding custom UV-reactive acrylic mods.

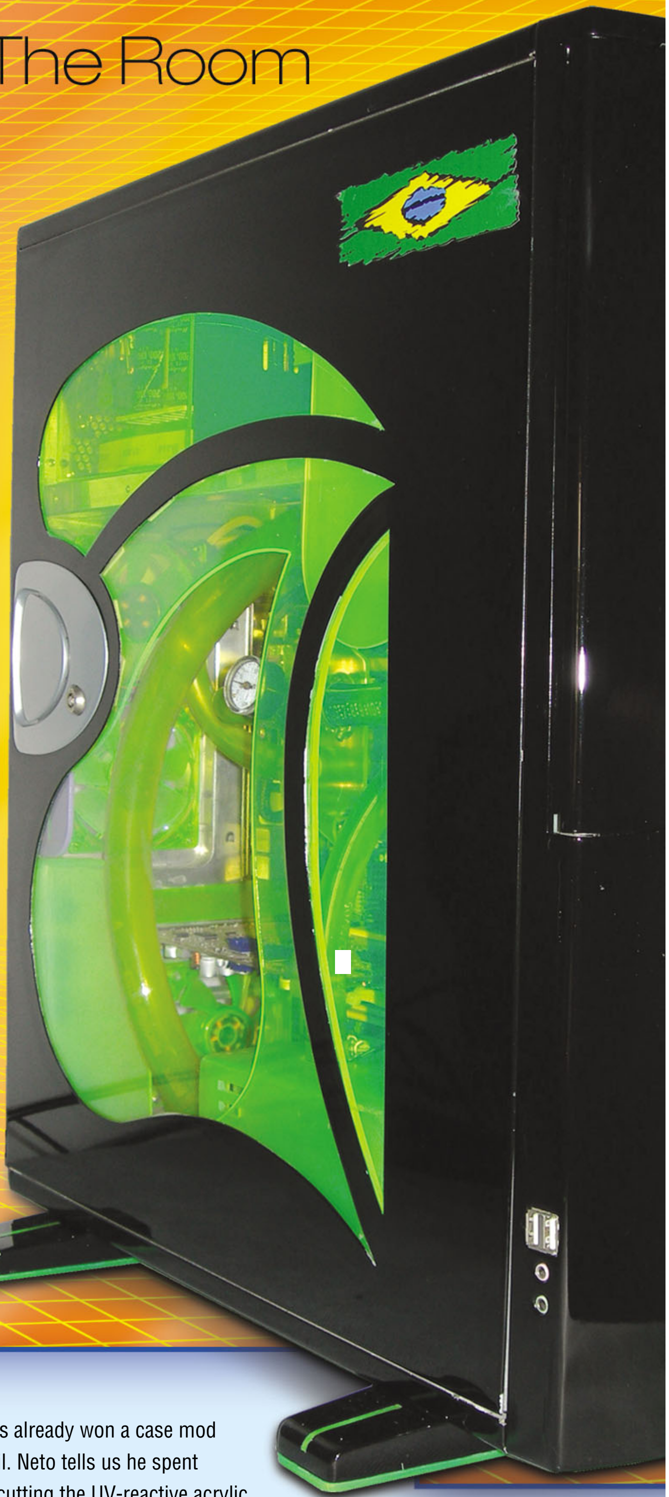
"The case was painted with urethane automotive paint using a color known in Brazil as 'Black Cadillac,' " says Neto.

Solar Storm's other panel features a custom multilayered window. Neto designed the window and cut the side panel and acrylic panels. Inside the case is a watercooling system, complete with in-line pressure gauges. Optical drives and the PSU crowded the upper section of the chassis and prevented Neto from installing the radiator horizontally, so he molded an acrylic panel that holds the radiator vertically at the front of the system. This extra panel has guides for the tubing and fan holes that let the radiator fans suck cool air into the system. The custom front panel grille enhances airflow.

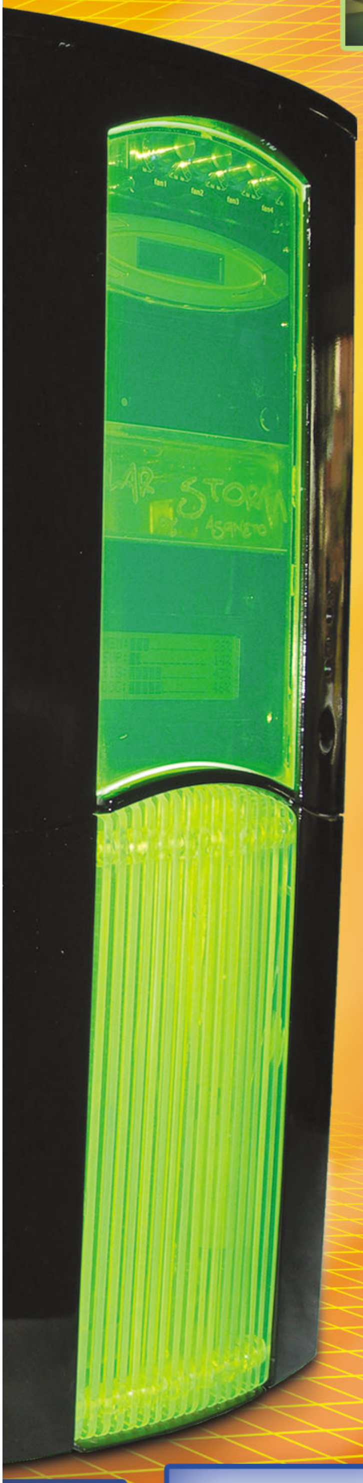
Lighting is the key to this mod's success. Neto embedded LEDs into the acrylic under the mouse pad and in the feet of the system and used BLB (Blacklight Blue) lights and a few well-placed LEDs to illuminate the interior. Thanks to the lights, Solar Storm looks as great in the dark as it does in a lit room. ▲

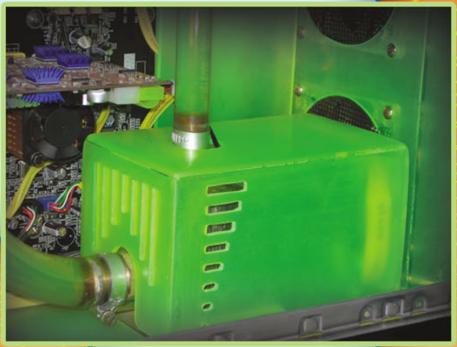
by Joshua Gulick





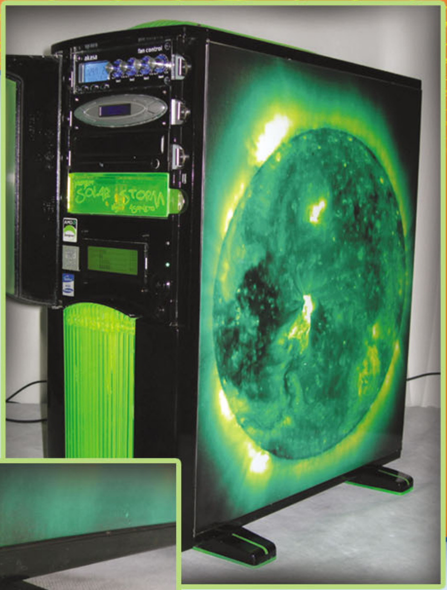
Solar Storm has already won a case mod contest in Brazil. Neto tells us he spent about 16 days cutting the UV-reactive acrylic, installing the watercooling system (which has UV-reactive dye), and painting the chassis.

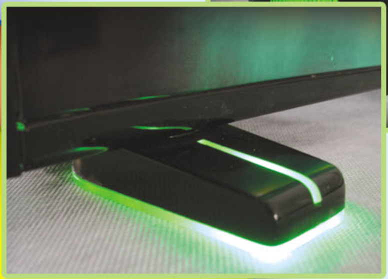




The pump cage includes an 80mm fan that pulls air from the radiator across the pump. The air exits via the vents Neto cut into the pump cage's front and sides. "The temperature of the pump is monitored by a Cooler Master CoolDrive 6 temp sensor," Neto says.

When you open the system's front door, you will find a packed front panel that includes fan controllers and the water reservoir. Neto used a Dremel to etch the mod name into the reservoir.

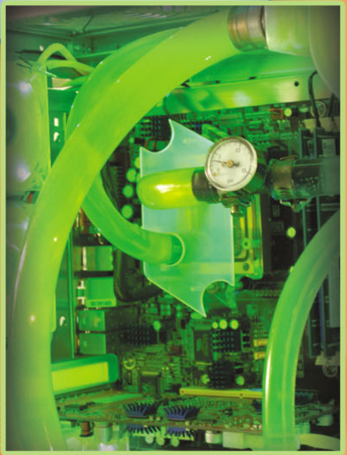


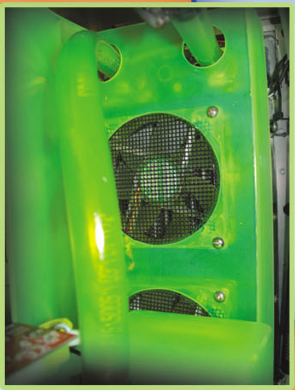


A 12V connector from the PSU powers the case's four lit feet, which have acrylic strips. Neto cut the acrylic himself and put LEDs into the feet. Each foot has three LEDs.

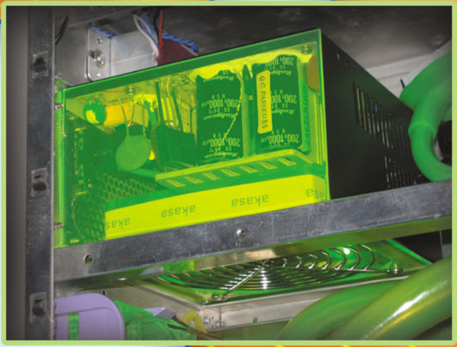
This image of a solar flare is on vinyl that extends to the edges of the side panel. "There are no lights behind the panel," says Neto. "The bright effect of the image is obtained by the painting colors."

"I used a TC-4 water block with a modified clear top to fit in the AMD socket 754,"says Neto. "The water block base plate was hand-lapped and polished with mirror finishing." Neto fashioned the acrylic panel to cover the tube clamps.





This acrylic wall holds the fans that pull air through the front panel, across the radiator, and into the system. The dial between the tubes is a pressure gauge. Neto used 1/2-inch diameter tubing from the reservoir to the pump and 3/4-inch tubing to the CPU.



Neto replaced the 420W Seventeam ST-420BKV's cover and 120mm fan with an Akasa UV-reactive fan. The new fan also has LEDs that light up the fan and PSU cover. Neto also added some black and yellow sleeving to the internal power cables.

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreadermod@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with $1,500 and a one-year subscription to *CPU*.

advanced Q&A corner

Get informed answers to your advanced technical questions from *CPU*. Send your questions along with a phone and/or fax number, so we can call you if necessary, to q&a@cpumag.com. Please include all pertinent system information.

> "The new Energy Efficient X2 processors are really no different than their 'normal' power counterparts, however."

Each month we dig deep into the mailbag here at CPU *in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable?* CPU*'s "Advanced Q&A Corner" is here for you.*

Rich D. asked: I'm having a problem with my system. I recently upgraded my video card from an Evga GeForce 7900 GT to an XFX GeForce 7950 GX2. My system has an Abit AA8-DuraMAX Intel 925X motherboard with a Pentium 4 660 processor and 2GB of Kingston RAM, and because I've only got one PCI Express x16 graphics slot, the 7950 GX2 was the fastest thing available. I've thought about swapping out my motherboard and going SLI, but it runs too good for me to touch it. I flashed my motherboard's BIOS so it would support the GeForce 7950 GX2 and I installed the drivers without a problem. When I play games or run some benchmarks, however, the 7950 GX2 is actually slower than my 7900 GT! But if I take the card over to my friend's house and try it in his system, it works fine. What do you think is going on?

A: If you're certain that the card is functioning properly, and we assume you are because it worked fine in your friend's system, there could be a couple of issues with your rig that you should check out. The first thing to do is go into Device Manager and make sure that your card is actually listed as a GeForce 7950 GX2. If you just removed your 7900 GT, installed the 7950 GX2 in its place, and let Windows detect it automatically, there is a chance the drivers weren't properly installed and, therefore, the PC is only utilizing one of the GPUs on the card. This would explain why the card seems to be performing slower than your previous 7900 GT. Ultimately, if you just plugged in your new GX2 and let Windows detect it, we recommend using the Add Or Remove Programs wizard in the Control Panel to uninstall your video drivers. After that, download and install the latest set of ForceWare drivers from Nvidia's site.

Another thing to check is if the card is configured for multi-GPU operation. Even though the GeForce 7950 GX2 doesn't require a motherboard based on an nForce SLI chipset, the card still functions in a pseudo-SLI mode because of its dual GPUs. Launch the ForceWare 90 Control Panel and navigate to the 3D Settings menu and then click the Set Multi-GPU Configuration link. In this menu, you can either run the card in Multiple Display Performance Mode or Multi-GPU Performance Mode. In Multiple Display Performance Mode, the GeForce 7950 GX2's GPUs function independently and you won't see any performance increases in games or benchmarks. But if you configure it to operate in Multi-GPU Performance Mode, the two GPUs will work in tandem, increasing performance. Considering that your card worked in your friend's system and that your motherboard is on Nvidia's approved list for the GX2, we suspect one of these two suggestions will help.

Jeff H. Asked: First off, thanks for your time and great magazine; I look forward to reading it every month. My current system is as follows:

- Enermax 420W EG425P-VE SFMA Noisetaker
- A8N-SLI Deluxe motherboard
- AMD Athlon 64 3200+ (Socket 939)
- Gigabyte GeForce 6600 GT 128MB GDDR3
- Kingston HyperX 1GB PC3200 Dual-Channel DDR Kit
- 80GB Maxtor HD
- LG DVD Writer optical drive
- Dell 2405FPW 24-inch widescreen display
- Z-5500 digital 5.1 speakers

I was thinking of upgrading to an AMD Athlon 64 4200+ and an ATI Radeon X1900 XTX 512MB GDDR3. (You guys recommended this card to a reader with the same display I use in the August "Q&A" on page 40.) I was wondering if my 420W PSU would be able to handle the upgrades I've mentioned. I've heard that these top-end video cards are power hogs, so I want to know whether I would need to upgrade the PSU when I upgrade my graphics card and processor.

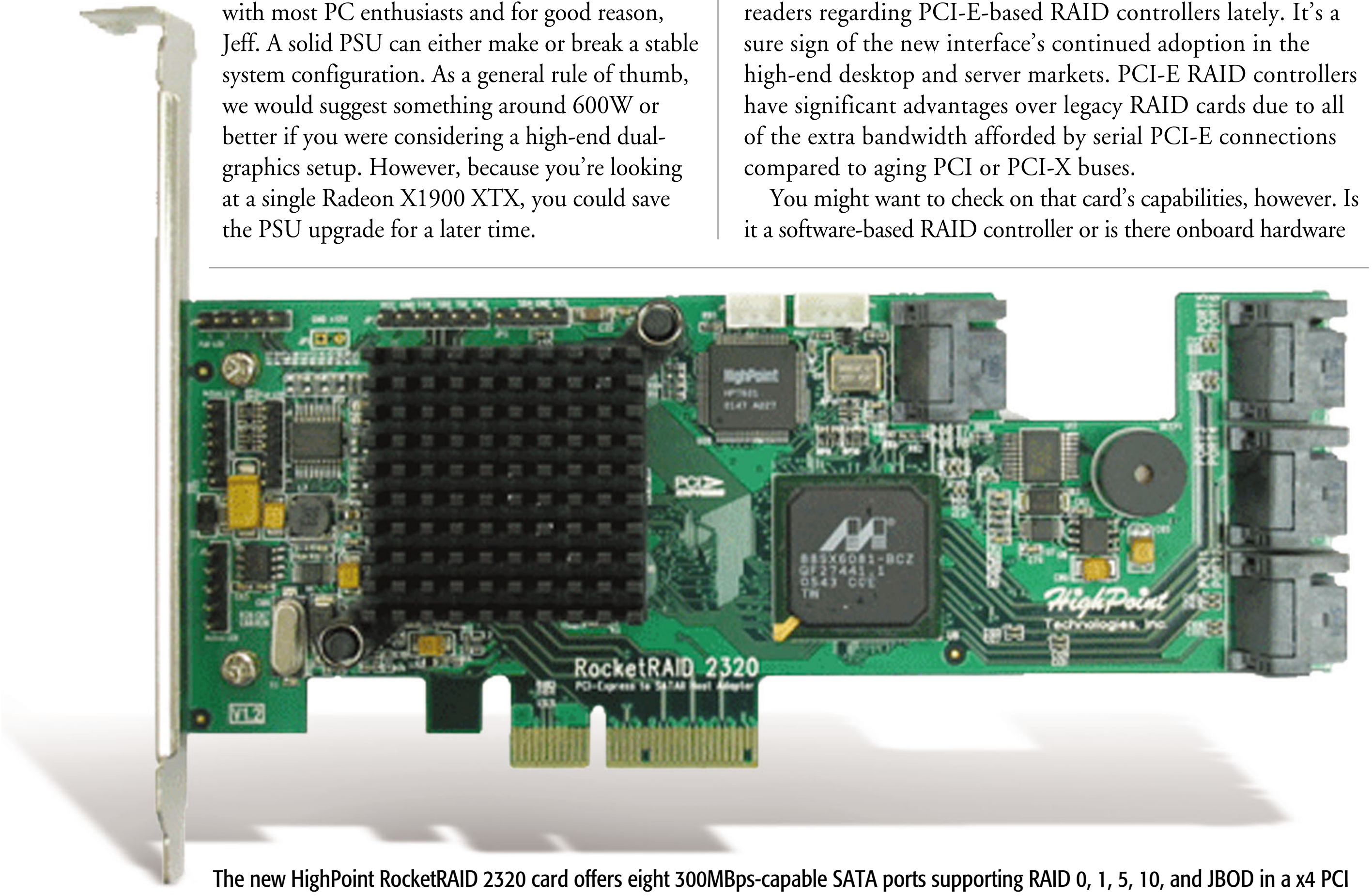
A: Power supply questions are always a hot topic with most PC enthusiasts and for good reason, Jeff. A solid PSU can either make or break a stable system configuration. As a general rule of thumb, we would suggest something around 600W or better if you were considering a high-end dual-graphics setup. However, because you're looking at a single Radeon X1900 XTX, you could save the PSU upgrade for a later time.

A quick check on the specs of your Enermax supply shows us the unit has a pair of +12V rails at 18A each, 30A across the +3.3V rail, and 30A across the +5V rail. Because you're not running a high-end RAID array with multiple drives and your CPU upgrade is still relatively modest, along with the X1900 XTX, the 420W Enermax supply you already own should power this system configuration with relative ease. Of course, you could simply try these system upgrades, and if things are stable, there's no need to upgrade the PSU. If you start having issues with random hard resets or crashing to the desktop when gaming, however, then the first place to look is your power supply. That said, we would be surprised if you had power-related issues with the configuration you noted. Moving forward, if you decide to drop in an SLI graphics setup based on Nvidia cards, you'll definitely need more power.

Scott J. asked: I would like to build a gaming rig with the following abilities: Quad SLI using two XFX 7950 GX2 512MB cards and a RAID 5 array using a HighPoint RocketRAID 2320 RAID controller in the available x4 PCI-E slot on an Asus A8N32-SLI Premium motherboard. The reason for the off-the-board controller is that I would like to provide hot-swap and metering capabilities to four WD 500GB hard drives in a five-drive RAID cage. So my question is: Can an x4 PCI-E card and two x16 PCI-E graphics cards run on the same board if the slots are available?

A: We've had more and more questions streaming in from readers regarding PCI-E-based RAID controllers lately. It's a sure sign of the new interface's continued adoption in the high-end desktop and server markets. PCI-E RAID controllers have significant advantages over legacy RAID cards due to all of the extra bandwidth afforded by serial PCI-E connections compared to aging PCI or PCI-X buses.

You might want to check on that card's capabilities, however. Is it a software-based RAID controller or is there onboard hardware



The new HighPoint RocketRAID 2320 card offers eight 300MBps-capable SATA ports supporting RAID 0, 1, 5, 10, and JBOD in a x4 PCI Express slot, but watch out for slow RAID 1 or 5 performance because it's only a software-based RAID controller.

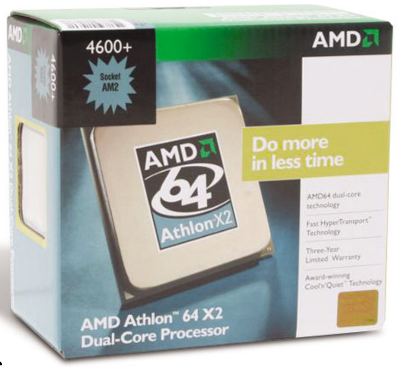
assistance for RAID processing? Looking at the card, the Marvell chip it uses is just a PHY (physical layer) device that provides SATA connectivity; in other words, it's just a "dumb" controller that doesn't provide hardware processing assistance for RAID. The larger chip under the heatsink is most likely a PCI-X-to-PCI-E bridge, which would explain the dozens of fine traces coming out of one side of the chip (to the PCI-X-based Marvell PHY chip) and the four traces going down to the x4 PCI-E edge connector.

This card poses two problems for you: First, RAID 5 has a fair amount of processing overhead associated with it for parity calculations. As a result, software-based RAID 5 setups aren't advisable for performance reasons, and with a system like this, our guess is performance matters to you. Second, the PCI-X-to-PCI-E bridge that this card uses also induces latencies associated with the translation required from PCI-X to PCI-E protocols. In short, we'd recommend this card for RAID 0 and RAID 1 setups at best. For RAID 5, we'd suggest a controller from a company such as 3ware, where hardware RAID 5 processing is done onboard without requiring additional host CPU resources and with much better performance. Take a look at 3ware's 9590SE series of cards and you'll notice that they're about twice as expensive as that HighPoint card, but you'll get what you pay for in performance.

With respect to your question regarding the HighPoint RocketRAID 2320 board running in addition to the Quad SLI setup you're envisioning, the answer is "yes." The nForce 4 SLI x16 chipset that the Asus motherboard uses contains a total of 38 flexible PCI-E lanes. A full 32 of those lanes you'll need to use for your dual GeForce 7950 GX2s in Quad SLI running in the board's two PEG slots. As you're aware, the board also has a x4 PCI-E slot that will run the RocketRAID card. That x4 slot has its own set of four dedicated PCI-E lanes and that slot is there exactly for what you intend it to be. It's a tight squeeze in that slot area of the board, however, so you might want to first check for fit before you take the plunge on any new RAID controller. Regardless, electrically and from a software perspective, you should have no problems—just make sure your power supply is up to the task.

> "PCI-E RAID controllers have significant advantages over legacy RAID cards . . ."

Daniel C. asked: **I've been reading up on AMD's new Energy Efficient Athlon 64 X2 processors for the Socket AM2 platform because I want to build a super-quiet home theater PC and these processors seem to be the perfect match. I'm just wondering how AMD is able to manufacture these processors. Everyone always talks about Intel's advantage when it comes to manufacturing processors, and now that the company's got the Core 2 Duo in its lineup, performance per watt seems to be everyone's favorite buzzword. Did AMD change its architecture to be more power-efficient like Intel? Or do the energy-efficient processors use less power because they are somehow crippled?**



AMD's Energy Efficient Athlon 64 X2 processors are based on the same core as the company's other desktop processors.

A: This may seem counter-intuitive because AMD obviously did something to bring these new processors to market, but the changes it made are minor compared to what Intel did with the Core 2 Duo. AMD's ability to produce its new Energy Efficient Athlon 64 X2 processors stems from two main developments: the incorporation of a DDR2 memory controller in its new AM2 processors and tweaks made to its 90nm manufacturing process.

DDR2 memory's on-die termination and lower voltage requirements already hint at the fact that DDR2 is more power-efficient than DDR memory. This doesn't directly affect Athlon 64 X2's on-die memory controller, but because its platform as a whole would benefit from more power-efficient memory, AMD took advantage of an opportunity to introduce its new energy-efficient processors. The new Energy Efficient X2 processors are really no different than their "normal" power counterparts, however. Normal and Energy Efficient Athlon 64 X2 processors are both based on the same Windsor core. But over time AMD has tweaked its 90nm SOI manufacturing process and incrementally improved its processors with new steppings that enhanced their power efficiency. In addition to this, AMD uses a process called speed binning to essentially handpick cores that will operate reliably with lower voltages. Whereas standard Athlon 64 X2 processors typically require 1.35 to 1.4V, the Energy Efficient processors need only 1.20 to 1.25V for 65W models (4600+, 4200+, and 3800+) and 1.025 to 1.075V for 35W models (3800+). It's really the lower voltages that make the new Energy Efficient Athlon 64 X2 processors more power-friendly. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

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GeIL EVO One

Overclockers, Remember This Memory

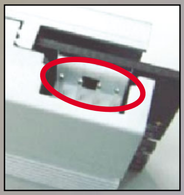
Engineers looking for more performance from a piece of hardware typically have two options. One, they can redesign the hardware to give it more capabilities. (Of course, any hardware redesign would involve added cost both for the company and for users.) Two, they can figure out how to wring more performance out of the hardware while maintaining its current configuration.

EVO One

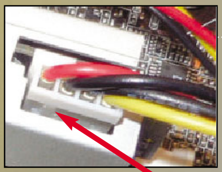
GeIL has combined these options into its EVO One memory module. (Or is it EVO 1? We weren't sure at press time because GeIL is still fairly coy about many of the details regarding this product, not the least of which is its exact name.) GeIL introduced the idea of EVO One at a few trade shows, including Computex, throughout the first half

EVO One Up Close

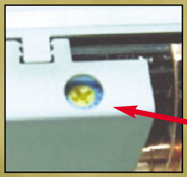
EVO One uses two technologies to achieve its performance: IPS (Independent Power System) and EVM (Enhanced Voltage Management). ▲



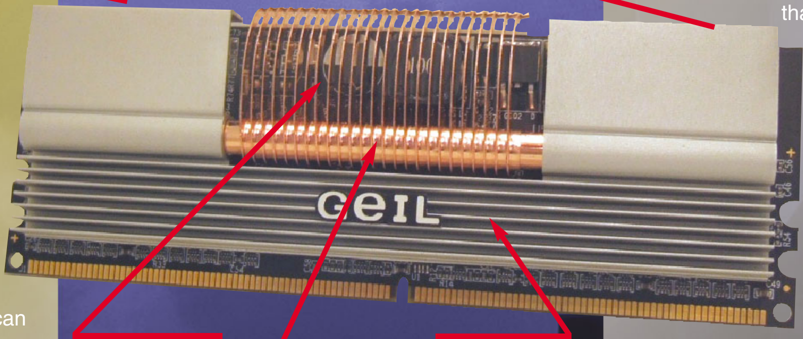
Connector pins for the IPS.



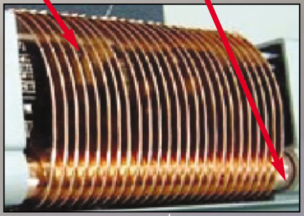
When using its IPS technology, EVO One essentially bypasses the power supply from the motherboard to the DIMMs. Instead, the IPS routes power to the DIMMs through a power connector that is similar to what you'd find feeding power to a floppy diskette drive (photo above). The IPS provides the DIMM with power directly from the PSU, making the power more stable for overclocking than the DIMMs pulling power through the motherboard.



EVM technology uses a top-mounted dial to adjust the voltage for the DIMM modules. This technology also helps the modules use all of the power they receive and stabilizes them when they are overclocking through the EVO One's VRMs. Through the adjustable EVM dial, users can manually adjust the EVO One's voltage between 2 and 3 volts (for a DDR2 module) at any time.



In addition to the new technologies included with EVO One, the memory module contains a copper heatpipe with a copper grille and aluminum heatspreaders to provide cooling for the unit. EVO One generates heat from multiple sources, including the DIMMs and the VRMs. (Plus, the copper and aluminum make the EVO One just look cool.)



Front view, upright

Edge view, module laying on its side

Sources: GeIL, NGOHQ.com, Hexus.net

of this year. However, at the time of this writing, GeIL hadn't yet released an exact date and price point for EVO One, but rumors on the Web suggest the module should be available to retailers in two to three months.

The EVO One memory modules are a power user's dream because they use the power they consume more efficiently. Also, because EVO One has direct access to a power source, it gives users the power they need to successfully overclock their memory.

As power users know, the importance of memory in gaming and running powerful applications continues to grow. Today's high-end memory modules sometimes require more voltage and stable power than a motherboard can deliver. (Voltage limitations in the motherboard's voltage rail that usually serves the memory modules prevents them from delivering enough power for overclocking memory modules.)

EVO One gives its memory more of an active role in controlling its power consumption. In other setups, memory is simply a component connected to the motherboard, relying on the motherboard and the system to deliver power, with no control of its own. But EVO One can control its power consumption directly from a PSU. With a stable and independent power source, overclocking efforts become more successful, too. Noise traveling on the power lines and the motherboard voltage rails in a traditional memory setup can cause stability problems with memory, especially when overclocking. Having the EVO One connect directly to a PSU provides stability and power that power users like us crave.

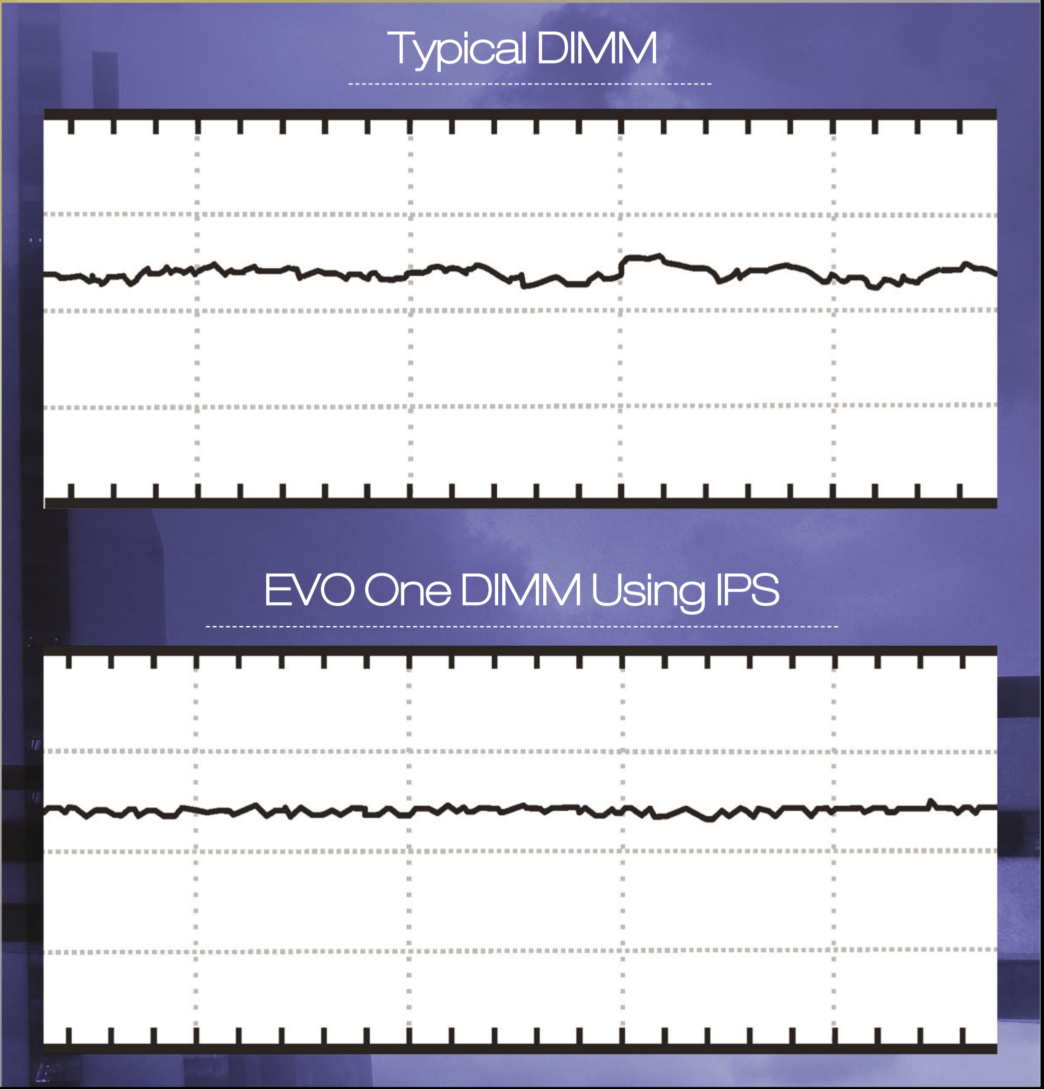
Finally, GeIL's design for EVO One may end up generating almost as much buzz as the product itself. Its combination of copper and aluminum might officially be for cooling, but the unit's good looks will make it a popular and worthwhile choice for users.

With EVO One, memory overclocking might never work—or look—better. ▲

by Kyle Schurman

Limiting Electrical Noise

The electrical noise that a power source generates for a DDR2 DIMM is greater with a normal DIMM compared to the EVO One's DIMM using IPS. (When more electrical noise is present, there are more variations in the line.) GeIL performed this test supplying 2.2 volts to a DDR2-533MHz memory module. ▲



Sources: GeIL, NGOHQ.com

Freescale MRAM

Nonvolatile Memory, Turbocharged

When you turn on your MP3 player, you don't have to wait long for it to begin playing music. When you click the power button on your TV's remote, you see a picture right away. Heck, when you push the lever on your toaster, the heater begins browning the bread immediately.

So why do you have to wait to begin working after pushing the power button on your PC? In large part this is the fault of your PC's RAM and the way it works and loads data.

An Introduction To MRAM

Finding a new solution to this memory problem isn't easy, but one technology, MRAM (magnetic RAM), may be stepping forward. In July Freescale Semiconductor introduced the first commercially available MRAM product. MRAM combines silicon-based microelectronics with magnetic devices, which theoretically lets it deliver some of the best features of many types of memory without some of their problems.

MRAM can't yet compete with more established memory technologies in density and price point, and companies won't aim the first several MRAM products at replacing the RAM in consumer-level PCs, but research is continuing. Early results are promising, giving MRAM a strong opportunity to make more headlines in the next several years.

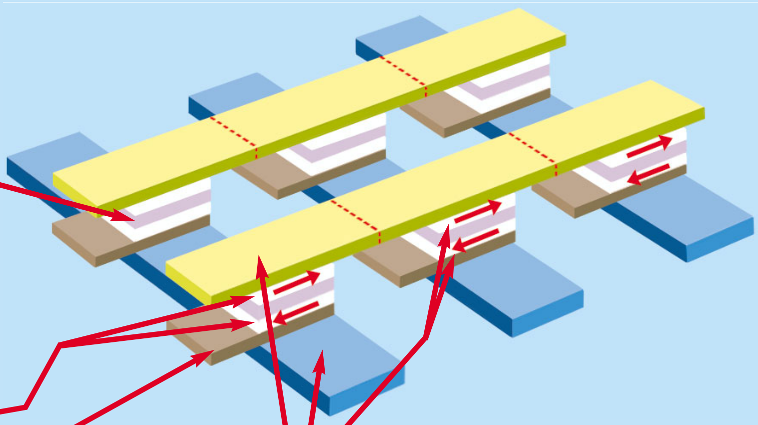
Volatile vs. Nonvolatile

MRAM is a nonvolatile type of memory, meaning it maintains its stored data even in the absence of external power. ROM and flash memory are examples of nonvolatile memory. Traditional RAM, on the other hand, is volatile and needs a constant electrical charge to hold its data; hence the delay in the boot-up process as the RAM loads its data. MRAM differs from volatile memory by storing its data using magnetic charges, rather than electric charges.

In most computing situations, volatile memory acts as short-term memory for the PC, serving as an area where a system stores data that's currently in use or that it may need quickly. Nonvolatile memory

MRAM Bits

Freescale Semiconductor became the first company to commercially offer an MRAM device earlier this year. This illustration shows the layout for six bits.



Tunneling is the process of how the magnetic layers in the transistor's MTJ (magnetic tunnel junction) polarize the electrons, causing them to traverse the dielectric barrier. Tunneling gives each transistor its ability to store a bit of data.

Each memory cell uses a 1T1MTJ (1-transistor, 1-magnetic tunnel junction) configuration. The MTJ area stores the data.

Transistors sitting above and below the MTJ area are the key to creating magnetic orientation.

To create the MRAM devices, Freescale arranges each MRAM bit in a grid. Long write lines run below and above the bits, with the lines aligned perpendicular to each other. The lines can run across thousands of bits.

When the fixed and free magnetic layers in the MTJ have magnetic moments (or sources) oriented in the same direction, the MTJ has a low resistance. When the layers have magnetic moments oriented in opposite directions, the MTJ has a high resistance. The difference between the low and high resistances signify the stored data bit, similarly to the difference between the "0" and "1" or the "on" and "off" of an electrical charge in traditional RAM.

Source: Freescale

typically has slower access times and costs more than volatile memory, so most computing systems that use nonvolatile memory restrict it to longer-term storage.

However, improvements and research with nonvolatile memory could make it more competitive with volatile memory for use as RAM in computers. Using nonvolatile memory for RAM would hold significant benefits because the system information would stay in memory even when you turn off the computer's power, meaning the PC wouldn't need a lengthy startup process.

"From the consumer perspective it would mean more reliable and faster networks, more reliable and cheaper machines in the office and home, and some new capabilities in equipment they may use in or out of the home," says Saied Tehrani, Freescale's director of MRAM and SmartMOS technology. "Different types of memory are best suited for different applications and products. That situation will persist for the foreseeable future. The boundaries shift depending on cost, performance, capacity, etc. We expect the market space occupied by MRAM to increase as the technology matures."

Work In Progress

The thought of MRAM's ability to end the drawn-out bootup process of today's PCs is exciting, but making the technology available for computer use is still probably several years away. Freescale's introduction of the first commercial MRAM product seems like it's been

MRAM Timeline

Although you can trace the technology behind MRAM back five-plus decades, most developments and research breakthroughs have occurred in the past few years.

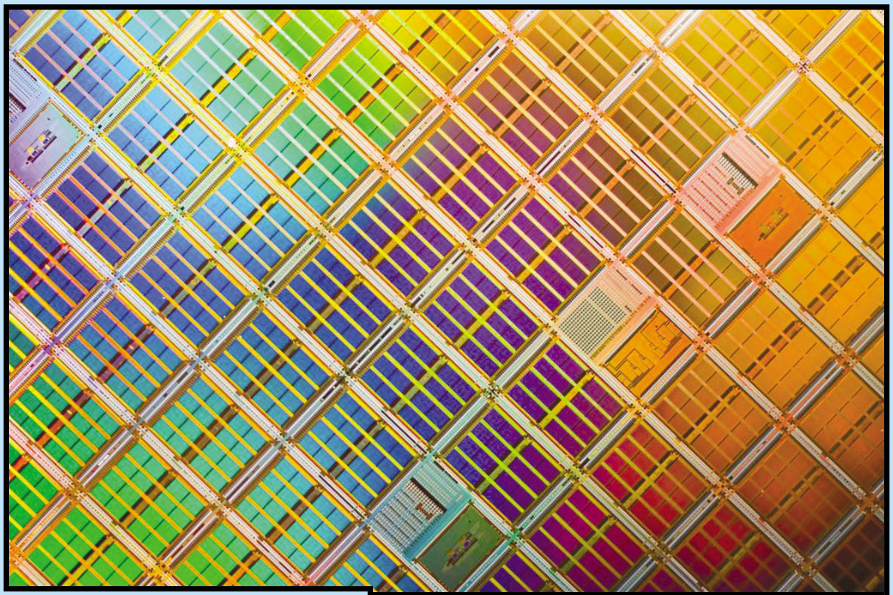
1955	Dr. An Wang receives a patent for magnetic core memory, which has some similar values as MRAM. Magnetic core memory eventually replaces drum memory and vacuum tubes. Silicon memory replaces magnetic core memory in the 1970s.
1989	IBM discovers the GMR (giant magnetoresistance effect), which is a key component in MRAM's development.
1996	DARPA (U.S. Defense Advanced Research Projects Agency) provides investments for Motorola, IBM, and Honeywell to begin independent MRAM research programs.
2000	IBM and Infineon combine to form an MRAM development program.
2002	Motorola demonstrates a 1Mb MRAM prototype chip.
2004	IBM and Infineon demonstrate a 16Mb MRAM prototype chip.
2005	Cypress decides to sell its MRAM subsidiary.
Feb. 2006	Toshiba and NEC demonstrate a 16Mb MRAM chip with a read/write speed of 200MBps (the fastest ever recorded).
July 2006	Freescale begins the first commercial shipments of an MRAM chip, which measures 4Mb and costs about $25.

Sources: MRAM-Info.com, Wikipedia.com, NIST (National Institute of Standards and Technology)

Fast Facts

The MR2A16A MRAM memory module from Freescale doesn't have the catchiest name, but its capabilities eventually could make it an extremely memorable product. Here are some of the MR2A16A's specifications.

- Manufactured with 180-micron CMOS process
- 4,194,304 bits (organized as 262,144 words of 16 bits)
- Single 3.3V power supply
- Temperature operation range: 0 to 70 degrees Celsius (32 to 158 degrees Fahrenheit)
- Access time: 35ns for read and write
- 10 years minimum data retention
- Designed primarily for: personal computers, PDAs, consumer electronics, and portable telecom products



MR2A16A on a silicon wafer with multiple dies.

Source: Freescale

a long time coming for proponents of MRAM, but it's a big step forward and may encourage other companies to push forward with their research into MRAM technology.

"As MRAM technology matures, the cost will decrease and volume will increase," Tehrani says. "This process will allow it to enter more market segments both as a standalone part and as a memory embedded in other chips for a variety of applications. As long as we are able to continue driving down the cost, the technology will continue finding its way into additional markets."

Until then, you can be productive during your startup wait time: Grab a cup of coffee—or two, catch up on Season 2 of "Battlestar Galactica" on your TiVo, or, if your PC is really old and slow, maybe you can finally read all of "War and Peace." Make the most of your PC's bootup time now because MRAM eventually may eliminate it. ▲

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by Kyle Schurman

Traditional MRAM Bit Cell vs. Freescale/Toggle MRAM Bit Cell

The MTJ contains a fixed magnetic layer, a tunnel barrier, and a free magnetic layer. In the fixed magnetic layer, the magnetic orientation of the layer doesn't change; it's "pinned" in place. The magnetic orientation of the free layer does change between two states, which yield the "0" and "1" of bit storage.

In the write process, the MRAM cell applies a magnetic field to the bit cell to set the orientation of the free layer and set the bit value for the bit cell. Electrical current flows through the write lines running above and below the MTJ, affecting only the orientation of the bit cell located at the intersection of the two perpendicular lines.

Ideally, the bit cell changes orientation only when current flows through both perpendicular lines. Current flowing through one line should bring the magnetic orientation of the free layer close to the switching point, but it should not switch the orientation. However, it's extremely difficult for designers to guarantee a consistent level of current through the lines. If the current's level is too strong or weak at any point in the line, the write process will fail and data errors (called disturbs) will occur in the memory cell. (The potential for disturbs is one of the biggest problems with traditional MRAM designs.)

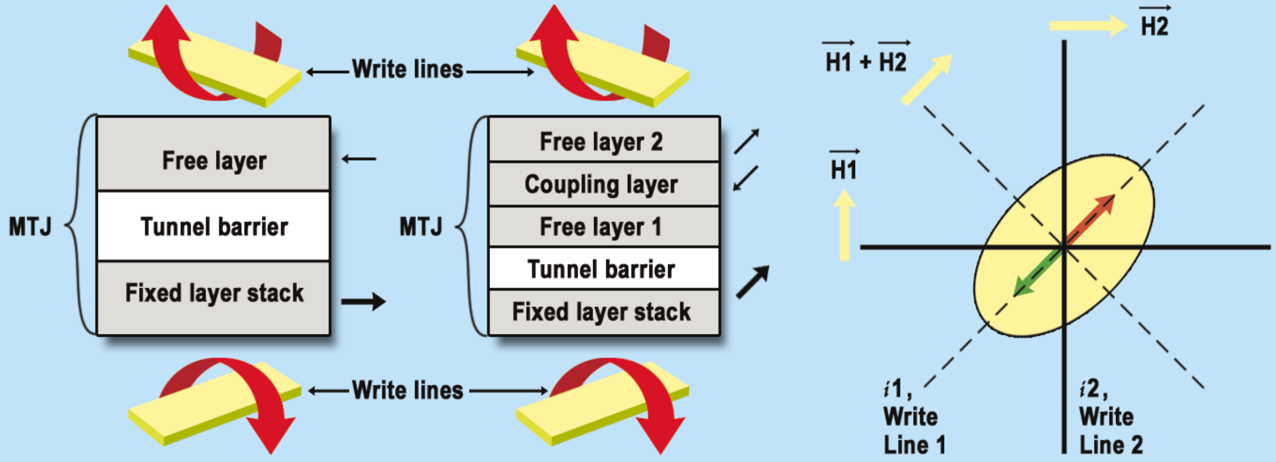
To measure the value of the bit cell (the read process), the MRAM device activates the MTJ (magnetic tunnel junction) of the individual bit cell, using the tunnel barrier to measure the orientation of the free layer in relation to the fixed cell, thereby determining the resistance state. If the two layers have a parallel orientation, resistance is low. If the two layers have an opposite orientation, resistance is high.

To prevent disturbs, Freescale has added layers to the MTJ. These layers decrease the likelihood that a current that isn't quite consistent can inadvertently change the orientation of the MRAM bit cell.

In the toggle MRAM bit cell, designers added a SAF (synthetic antiferromagnetic) coupling layer. The designers also slightly rotated the stable orientations for the fixed magnetic layer and the free magnetic layers, placing the orientations at a 45-degree angle to the write lines, which makes them far more stable than when they're parallel to the write lines. The 45-degree rotation only affects the stability of the bit cell magnetic orientation; it doesn't cause any problems with the read operation.

The write process for a toggle MRAM bit cell differs from the traditional MRAM write process. The toggle MRAM write process requires pulses of current to occur in a specific sequence to change the orientation of a bit cell. The sequence first reads the bit cell by determining the orientation of the data in the cell. If the bit cell is already at the desired orientation, the process stops. If the system needs to change the orientation, the write sequence continues and the bit cell's orientation "toggles" to the desired orientation.

The stable magnetic orientation of the bit cell is at a 45-degree angle to the lines. As currents (i1 and i2) move through Write Line 1 and 2—beginning a sequence of moving currents through each line—the magnetic orientation of the bit is read. If the bit's value needs to be changed, the pulses of current will move in the proper sequence to eventually flip the bit's magnetic orientation (in this example, flipping from the red orientation to the green orientation). ▲



Source: Freescale

Memory Comparisons

	SRAM	DRAM	FLASH	FRAM	MRAM
Read time	Fast	Moderate	Fast	Moderate	Moderate/Fast
Write time	Fast	Moderate	Slow	Moderate	Moderate/Fast
Nonvolatile?	No	No	Yes	Yes	Yes
Refresh	No	Yes	No	No	No
Cell size	Large	Small	Small	Medium	Small
Low voltage	Yes	Limited	No	Limited	Yes

Sources: NIST (National Institute of Standards and Technology), Motorola, Freescale, TheStreet.com

MRAM combines many of the best features of existing memory technologies, which has caused some media outlets to dub it the "Holy Grail" of memory technologies.

"MRAM is the only memory that has all the major desirable attributes: speed, nonvolatility, and unlimited endurance," says Saied Tehrani, director of MRAM and SmartMOS technology at Freescale. "From that point of view MRAM is the Holy Grail. However, for applications that favor one or two particular attributes, a memory that sacrifices something else to be good in those attributes has an advantage. Time will tell how much of the overall memory market can be covered by MRAM."

MRAM initially will compete with flash in most markets. Flash and MRAM both offer the benefits of nonvolatile memory, but MRAM has a lower voltage and an unlimited life span. Flash memory can wear out after 100,000 to 1 million rewrites. And because of these drawbacks, Flash memory doesn't work well in all applications, opening the door for MRAM.

At this point, the biggest drawback for MRAM is its high cost (a single 4Mb chip costs $25) compared to today's more established memory options. However, costs should come down as the MRAM technology matures.

Freescale also eventually expects to integrate its early MRAM modules with a microprocessor as an all-in-one solution for embedded processor markets. ▲

Source: Freescale

MRAM Companies

Today several companies have worked and are working on variations of MRAM. Other companies involved in MRAM production have had difficulty meeting expectations for the technology and have experienced frustrating delays in rolling out products, causing a number of them to abandon MRAM research.

Canon Anelva has developed sputtering equipment that companies can use to manufacture MRAM.
www.canon-anelva.co.jp/english/index.html

Cypress announced sampling of some MRAM products in 2005, but has since decided to sell off its MRAM subsidiary.
www.cypress.com

Freescale Semiconductor recently introduced the first MRAM chip to the commercial market.
www.freescale.com

Grandis is developing a form of MRAM that uses STT (spin torque transfer) technology.
www.grandisinc.com/index.html

IBM has led much of the research into MRAM over the past several years, working closely with Infineon. But IBM hasn't made moves toward high-volume production.
www.ibm.com

Infineon has partnered with IBM for the past several years. But the company hasn't made any new announcements regarding its MRAM research in the past two years.
www.infineon.com

Micromem is developing and researching MRAM products for use with RFID technology and other applications.
www.micromeminc.com

NEC collaborated with Toshiba in February 2006 to demonstrate a 16Mb MRAM chip with high read/write speeds. In July 2006, NEC announced it had increased the chip's read operation to 500MHz.
www.nec.com

NVE holds many patents involving spintronic MRAM, which uses spinning electrons to store information.
www.nve.com

Renesas is working with several types of memory and announced an agreement with Grandis in 2005 to develop MRAM using STT.
www.renesas.com

Spintron is researching a twist on MRAM called e-MRAM (embedded MRAM). Its e-MRAM would use CMOS manufacturing technologies to lower the costs and complexity of manufacturing MRAM.
www.spintron.fr/us/index_us.htm

Toshiba collaborated with NEC in February 2006 to demonstrate a 16Mb MRAM chip with high read/write speeds.
http://www.toshiba.co.jp/index.htm

Source: MRAM-Info.com, TheStreet.com

Pimp My Rig

Extreme Performance At A Discount

We know that you love to ogle thousand-dollar processors and dream PCs, but we also know you're not the Sultan of Brunei. (Unless, of course, you are reading this, Your Majesty, in which case you *are* the Sultan of Brunei.)

With an infinite supply of cash, anyone can assemble a screaming rig (or commission a third party to do so). And although we all aspire to have a system that laughs at the latest games and demanding apps, the reality is that most of us simply don't have the war chest to fund such a build. There's nothing quite like an unexpectedly high electric bill or sudden tuition hike to throw a wrench in our upgrade plans. We're lucky to have SLI, let alone Quad SLI.

Overclocking is certainly a viable option to squeeze a little more performance out of our hardware and stretch our dollars a little further, but most components don't have significant enough headroom to make a jaw-dropping difference. Without aftermarket cooling, we essentially trade stability for a few extra fps.

But every now and then, a drool-inducing component sends hardcore modders into a feeding frenzy. Whether it's a graphics card that's a BIOS flash away from extra pixel pipelines or a budget mobo with a cornucopia of overclocking options, cheap hardware that you can transform into benchmark busters with a little effort is one of the cornerstones of modding. Sapphire's Radeon X800 GTO^2 (see page 40 of the April 2006 *CPU*) graphics card and Intel's relatively new Core 2 Duo E6300 (see page 40 of the October 2006 *CPU*) are two prime examples.

"Overclocking has always been a form of art. Aside from getting the right hardware, overclockers need to learn to read all the advanced options in their BIOS, understand what they mean and how they work (not just 'turn this up and the computer runs faster')," says Ian Ho, Thermaltake's director of marketing.

Making AMD-Intel and ATI-Nvidia comparisons at default speeds is fairly straightforward, but how does the ballgame change when you factor in getting the most bang for your buck? Is pricey RAM necessary, or can you find a diamond in the midrange rough? We wanted to answer these questions (among others), so we set out to find the best of a different best—the best hardware for the everyman.

We started with motherboards (page 52), the gathering place for our components. Without a stable, overclocker-friendly mobo, you won't have much success in your performance boosting endeavors. Next, we examined processors from both camps. Intel's been grabbing headlines lately with its Core 2 Duo family, but we'll also give you a sampling of AMD's feisty processors for the frugal shopper (page 56). And because we were doing some serious overclocking to our CPUs, we needed inexpensive RAM that would come along on the ride without protesting (page 65). To satisfy fans under Team Green's and Team Red's respective tents, we sought out one graphics card from each company that lent itself to maximum tweakability (page 60). Once we had selected our champions, we threw them together under one roof and up against our Ultimate AM2 and Conroe systems to illustrate the performance you can expect when money *is* an object (page 67).

The right hardware is crucial, but without the proper *scientia*, at best you'll have a system that does exactly what it promises to do: deliver midrange performance. At worst, you'll be sitting on a pile of roasted silicon wishing you had simply sought a Sony laptop battery to save time. Pay close attention to the how in addition to the what. How much voltage is too much? How should you keep your components cool—a watercooling system or an HSPC Tech Station? How do you prepare a processor's heat spreader to achieve the best possible thermal transfer? We'll show you how to get from stock to overclocked without hitting too many bumps in the road.

A skilled craftsman is nothing without his tools, and practical power users are no exception. Your trusty Philips screwdriver might help you put a system together, but you'll need metal polish, plenty of thermal paste, and a handful of other helpful items if you want to unleash your components' true potential. Check out "The Modder's Toolkit" on page 35 to take a peek at one modder's arsenal.

At the end of the day, money talks, and the only way to get a cutting-edge rig is to fork over a king's ransom. But for the vast majority of us living in the real world, there's nothing quite as satisfying as making the right adjustments to have the fastest *and* cheapest PC at your next LAN party. ▲

by Vince Cogley

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Tweakable Midrange Mobos

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Mommy Dearest

Tweakable Midrange Mobos

Intel Platform

Abit AB9 — Intel P965

For the past few years, Intel's relatively hot-running and underperforming Pentium D processors were simply not as appealing to most power users as AMD's Athlon 64 X2, and it showed in Intel's reduced market share. For this reason, among some others, enthusiast-class Socket T/LGA775 motherboards have been nowhere near as prevalent as those for AMD's platform. Currently, though, with the release of the Core 2 Duo line of processors, Intel has recaptured the desktop performance crown, and there's a renewed interest in the Intel platform. Slowly but surely, more and more enthusiast-friendly motherboards for Intel's platform have hit the scene, but initially most Core 2-compatible motherboards were either expensive, highly integrated offerings or barebones models for budget builds. Now that some time has passed and Core 2 processor prices have stabilized and recovered from the initial rush, a few dozen midrange Core 2-compatible motherboards have surfaced.

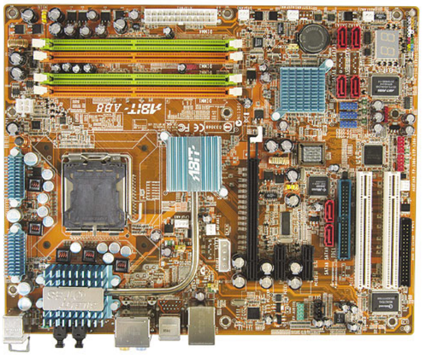
Build The Foundation

Selecting the right motherboard for a build can be difficult because there are many things to consider, such as the number and configuration of the expansion slots, whether the board has support for the various multi-GPU technologies, RAID support, etc. For our Intel-based practical power user PC, we decided we didn't need multi-GPU support because we were only

Abit AB9 vs. Intel D975XBX

It may be less expensive and based on a different chipset, but the Abit AB9 had no trouble hanging right alongside Intel's flagship D975XBX motherboard in terms of overall performance. When we tested it with a Core 2 Extreme X6800 processor and a GeForce 7900 GTX card, running Windows XP SP2, the Abit AB9 performed similarly in most applications and even surpassed the 975X Express-powered D975XBX motherboard in the gaming tests. ▲

	Abit AB9 Intel P965 Core 2 Extreme X6800 at 2.93GHz	**Intel D975XBX 975X Express Core 2 Extreme X6800 at 2.93GHz**
SiSoft Sandra 2007 Pro		
Processor Arithmetic		
Dhrystone ALU	27,124Mips	27,166Mips
Whetstone iSSE3	18,446MFlops	18,438MFlops
Processor Multimedia		
Integer x4 aEMMX/aSSE	159,651itps	159,627itps
Floating-Point x4 iSSE2	86,404itps	86,392itps
Memory Bandwidth		
Integer Buffered iSSE2	5,640MBps	5,607MBps
Floating-Point Buffered iSSE2	5,638MBps	5,602MBps
LAME MT MP3 Encoding (minutes:seconds)		
Single-threaded	0:46	0:47
Multithreaded	0:32	0:32
Cinebench 2003 (seconds)		
Single-threaded	51.9	51.8
Multithreaded	26.6	28.4
KribiBench v1.1		
Sponge Explode Model	6.13fps	6.14fps
Ultra Model	1.97fps	1.97fps
F.E.A.R. v1.07		
Low-resolution CPU test (640 x 480, low quality)	281fps	272fps
Quake 4 v1.2		
Low-resolution CPU test (640 x 480, low quality)	206.8fps	203.5fps



Intel's P965 chipset is at the heart of Abit's AB9 motherboard. For about $130 the AB9 offers support for all current Core 2 processors and a host of useful features such as Gigabit LAN, HD audio, and SATA RAID.

using a single graphics card. Also, we needed a board that was overclockable, affordable, and supported every LGA775 Intel processor and had integrated Gigabit LAN, SATA RAID, and high-def audio.

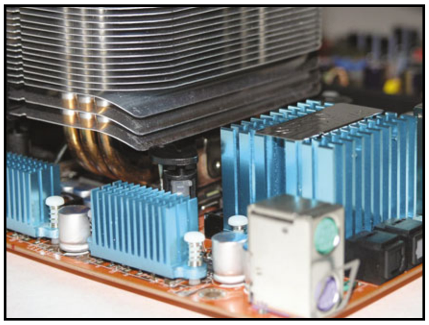
After a bit of searching, we eventually settled on Abit's AB9 because it met all of our criteria and is based on Intel's newest desktop chipset, the P965. In our Core 2-compatible motherboard roundup (Sept. *CPU*, page 54), the P965 chipset was every bit as fast as the more expensive 975X Express. It also offers several of the same features and includes the newer ICH8R southbridge chip, as well.

Before installing the AB9 into our rig and subjecting it to a battery of stability tests and benchmarks, however, we took a couple of steps to ensure the best possible experience. First, we made sure all of the board's heatsinks were seated properly and replaced inferior thermal pads with a high-quality thermal paste where we could. Next, we downloaded the latest BIOS for the board from Abit's Web site. Some experts urge against flashing a motherboard's BIOS if a system is functioning properly because it can be hazardous to the board if you do it incorrectly or if something goes awry, but we tend to take a different approach. Oftentimes, when a motherboard manufacturer releases a new BIOS, it's to resolve a certain bug or incorporate new features. (For example, the latest BIOS release for the Abit AB9 helped resolve compatibility issues with certain types of memory and fixed a bug that wouldn't let users manually set the CAS latency to 5 or 6.) So, that's why we say follow the instructions and flash to the latest BIOS available. Not only could you end up with new features, but also you could help prevent compatibility problems with components you plan to purchase in the future.

Strengthen The Union

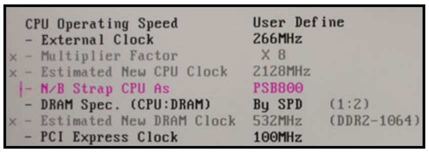
There are a couple of other things to consider when choosing a motherboard. If you're a fan of watercooling, for example, you should shy away from passively cooled motherboards unless your case has some fans for air circulation. This is because the air blowing through a CPU's heatsink isn't just for cooling the processor, it's also meant to help cool the VRM and northbridge heatsinks. Without any air circulating over its heatsinks, a passively cooled motherboard could eventually overheat and fail. For a more practical build in which watercooling isn't an option, selecting the right CPU cooler can also benefit the motherboard. The Arctic Cooling Freezer 7 Pro we used is actually designed to redirect some air from its cooling fan down toward the motherboard to keep the VRM cool. On a motherboard such as the Abit AB9, which has heatsinks on its warmest running components, the benefits a cooler such as the Freezer 7 Pro offers are a definite plus that should help enhance the board's stability and overclockability.

Arctic Cooling's Freezer 7 Pro is an inexpensive upgrade from Intel's boxed heatsink and fan combo.



The Freezer 7 Pro not only does a good job of keeping the processor from overheating, but its design also helps cool the motherboard's VRM by directing airflow toward its heatsinks.

Tweak The BIOS

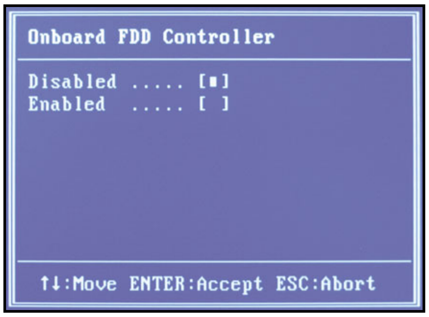


```
  CPU Operating Speed               User Define
  - External Clock                  266MHz
x - Multiplier Factor                X 8
x - Estimated New CPU Clock         2128MHz
 |- N/B Strap CPU As                PSB800
  - DRAM Spec. (CPU:DRAM)           By SPD    (1:2)
x - Estimated New DRAM Clock        532MHz    (DDR2-1064)
  - PCI Express Clock               100MHz
```

On the Abit AB9, you can use the BIOS option N/B Strap CPU to run your RAM at speeds faster than 800MHz without having to overclock your processor.

Aside from coupling the Abit AB9 with a complementary cooler and slightly tweaking the hardware for better cooling, there is also an assortment of BIOS options that you can modify to increase performance. One general rule of thumb that pertains to all motherboards is to disable any integrated peripherals that you won't use. For instance, if you don't have plans to use serial, parallel, or game ports or floppy, FireWire, or RAID controllers, go ahead and disable them to eliminate the need to install drivers for them and free up resources. We also suggest disabling video and BIOS shadowing or caching because these features don't offer benefits in a Windows computing environment or do anything more than consume a small amount of RAM.

In addition, there are some more specific tweaks that can enhance performance, but they go by different names depending on the motherboard manufacturer. On our Abit AB9, we experimented with its N/B



```
Onboard FDD Controller

Disabled ..... [■]
Enabled  ..... [ ]

↑↓:Move ENTER:Accept ESC:Abort
```

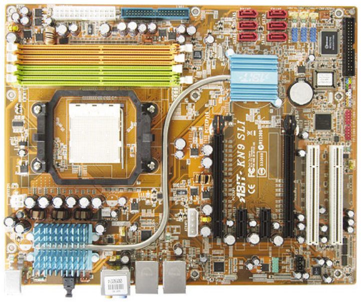
Disable any unused peripherals via the system BIOS to minimize potential conflicts and streamline a system.

Strap CPU option that gave us the ability to run our RAM at frequencies faster than 800MHz without having to overclock the processor. Some motherboards also offer automatic overclocking options, but we have a tendency to disable these and tweak manually. There are no hard-and-fast rules for overclocking, so it's best to dial in settings manually for optimal performance.

AMD Platform

Abit KN9 — nForce 570 SLI

Ever since the Socket 939 platform's initial ramp, fans of AMD's processors have had a wide array of excellent motherboards to choose from. Now that the newer Socket AM2 is here, pickings are a little slimmer, but there are still plenty of fine choices available for virtually any budget.



The nForce 570 SLI chipset powering the Abit KN9 SLI doesn't have all of the features of its pricier counterpart, the 590 SLI, but it does offer similar performance.

Abit KN9 SLI vs. Asus M2N32-SLI

In a multi-GPU configuration, where the nForce 590 SLI's additional PCI Express lanes' extra bandwidth comes into play, Nvidia's flagship chipset is usually the best choice for power users. But the nForce 570 SLI's single-chip nature lends itself to lower latencies that can increase performance in nonbandwidth-bound situations. This proved true in our testing: When coupled with an Athlon 64 X2 5000+ processor and a single GeForce 7900 GTX running Windows XP SP2, the nForce 570 SLI-powered Abit KN9 SLI offered all of the performance of a more expensive nForce 590 SLI-powered board. ▲

	Abit KN9 nForce 570 SLI Athlon 64 X2 5000+ at 2.6GHz	**Asus M2N32 SLI nForce 590 SLI Athlon 64 X2 5000+ at 2.6GHz**
SiSoft Sandra 2007 Pro		
Processor Arithmetic		
Dhrystone ALU	18,896Mips	18,947Mips
Whetstone iSSE3	15,987MFlops	16,006MFlops
Processor Multimedia		
Integer x4 aEMMX/aSSE	49,123itps	49,159itps
Floating-Point x4 iSSE2	53,530itps	53,536itps
Memory Bandwidth		
Integer Buffered iSSE2	7,491MBps	7,489MBps
Floating-Point Buffered iSSE2	7,443MBps	7,439MBps
LAME MT MP3 Encoding (minutes:seconds)		
Single-threaded	1:17	1:17
Multithreaded	0:50	0:50
Cinebench 2003 (seconds)		
Single-threaded	71.3	71.3
Multithreaded	38.1	38
KribiBench v1.1		
Sponge Explode Model	4.74fps	4.74fps
Ultra Model	1.48fps	1.47fps
F.E.A.R. v1.05		
Low-resolution CPU test (640 x 480, low quality)	184fps	179fps
Quake 4 v1.2		
Low-resolution CPU test (640 x 480, low quality)	148.8fps	148.1fps

Because we were focusing our efforts on putting the foundation for a functional PC in place, we approached our AMD platform motherboard selection process with certain goals in mind. We didn't need multi-GPU support, but we wanted a current-generation chipset with support for HD audio, Gigabit LAN, and SATA RAID. And as was the case with our Intel-based motherboard, our AM2 mobo had to be affordable and overclocker-friendly. So, we again turned to Abit and settled on the KN9 SLI. We reviewed the Abit KN9 in our recent Socket AM2-based motherboard roundup (August *CPU*, page 56) and found its performance to be competitive and were especially fond of its clean, well-organized layout. As its name implies, the KN9 SLI supports Nvidia's multi-GPU SLI technology, thanks to the nForce 570 SLI chipset at its heart. As added bonuses, the NK9 SLI is available online for about $120 and has a very complete BIOS.

Bring Her Up To Speed

We performed the same basic heatsink/cooling mods we did on the Intel

Future-Proofing: Choose Your Chipset & Socket Wisely

With the fevered pace at which technology marches forward, many computing enthusiasts are hesitant to overhaul their systems for fear of premature obsolescence. No one ever wants to purchase a new motherboard, RAM, or processor, only to find out that a few months later the CPU manufacturer he prefers plans to change sockets or support a new memory standard. Fortunately, the current state of Intel and AMD platforms should remain unchanged into the immediate future. Enthusiasts should still put some thought into motherboard and RAM considerations, however, to ensure the longest life span possible.

Intel's desktop computing platform will continue to revolve around the Socket T/LGA775 infrastructure and support DDR2 RAM. Upcoming quad-core processors will work on existing generation chipsets and motherboards, but according to recent road maps, Intel is planning to revamp its desktop chipset lineup in the second half of 2007. Users in the market for an Intel-based system today, though, should definitely look for a motherboard based on the P965 or 975X Express chipsets or current-generation chipsets from Intel's partners that have full support for the Core 2 Duo family of processors. Existing motherboards that support Core 2 Duo will also support upcoming quad-core processors and offer users an upgrade path for as long as Intel releases Core-based processors with FSB frequencies of 1,066MHz or lower.

Late next year Intel has plans to release the Bearlake family of chipsets, and with them will come support for DDR3 RAM and a 1,333GHz FSB speed. At that point it's likely Intel will introduce a new family of processors to exploit the faster RAM and FSB. If everything goes according to plan, by the holiday season next year fans of Intel's platform will probably need to replace some existing components to stay on the cutting edge.

AMD recently introduced its Socket AM2 platform that brought with it a new 940-pin socket and support for DDR2 RAM. Although AM2 fully supports current Athlon 64 X2 processors, the company introduced this new platform to lay the groundwork for its next-generation dual- and quad-core processors. Most Socket AM2 motherboards based on current-generation chipsets, such as the Nvidia nForce 500 family or ATI CrossFire Xpress 3200, should be compatible with upcoming AMD processors, and the platform should offer users a viable upgrade path for at least a few years. The merger of AMD and ATI will likely yield some newer chipset designs sooner rather than later, but AMD still has plans to cultivate its relationships with existing partners. Don't expect AM2 to disappear in favor of a proprietary platform anytime soon. ▲

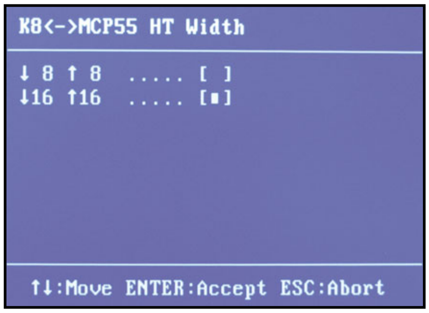
motherboard on the KN9 SLI. Replacing thermal pads with higher-quality thermal paste and ensuring all of the motherboard's heatsinks are seated properly won't yield large gains in terms of cooling performance, but anything that enhances cooling is helpful in the long run. We also used a cooler on our AM2 build that blows plenty of air across the motherboard's VRM, the Thermaltake Mini Typhoon. The Mini Typhoon is a universal-type cooler that works on all popular platforms, but we found that its retention mechanism gets in the way of the capacitors surrounding the CPU socket on some Intel motherboards, so we felt it was best suited to cool AMD processors.

We also updated our KN9 SLI's BIOS with the latest version available on Abit's site. The KN9 SLI's BIOS history further solidifies our belief that power users should upgrade to the latest BIOS for their motherboards whenever possible. Over the course of the past three revisions of the KN9 SLI's BIOS, some of the major fixes included adding a tweak to enhance compatibility with certain memories, locking the frequency of the PCI bus at 33MHz to aid in overclocking, and adding proper support for the GeForce 7950 GX2.

BIOS Tweaks

Many of the same BIOS tweaks for the Intel platform apply to the AMD platform. We always recommend disabling any unused peripherals and setting any overclocking-related options manually, but with AMD processors there are a handful of other options worth checking, as well.

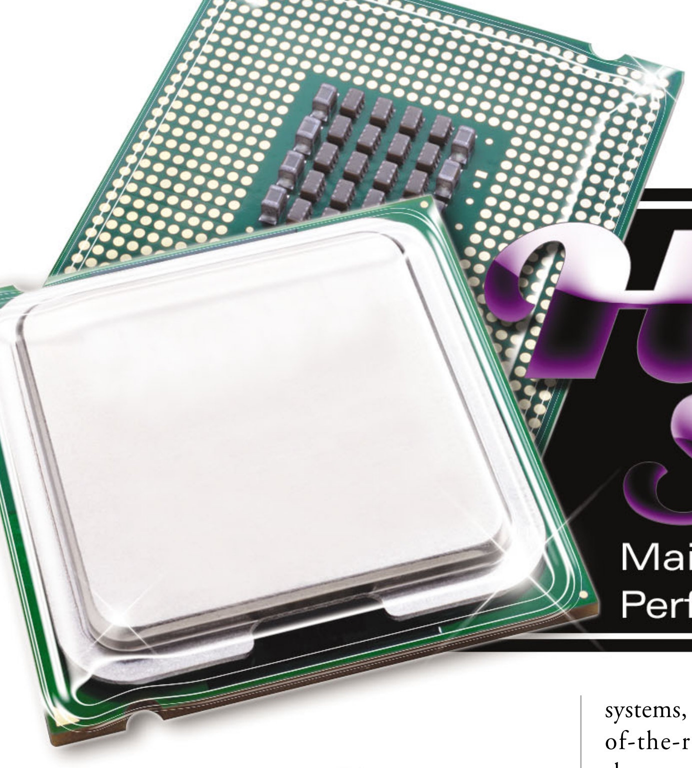
Because current AMD processors have traditional northbridge functionality incorporated into the CPU itself, the idea of an FSB doesn't apply. The processors communicate with the chipset through a HyperTransport link, and the speed of that link can affect performance and overclockability. For maximum performance when not overclocking, make sure the HyperTransport width is set to 16 bits (upstream and downstream) and that the frequency is set to 1GHz (2GHz DDR). Usually you can determine the frequency by setting a multiplier in the motherboard's BIOS. A 5X multiplier used with the Athlon 64 X2's 200MHz reference clock results in the maximum recommended speed of 1GHz. When raising the reference clock speed during overclocking, however, it's sometimes necessary to lower the HT multiplier to keep the system stable. Another thing to keep in mind when tweaking an AMD-powered system is that due to its on-die memory controller, lower memory latencies typically have a larger impact on performance. If possible, couple AMD processors with the lowest memory available within your budget. ▲



```
K8<->MCP55 HT Width

↓ 8 ↑ 8  ..... [ ]
↓16 ↑16  ..... [■]

↑↓:Move ENTER:Accept ESC:Abort
```

One way to ensure an AMD platform-based motherboard is performing optimally is to set the HyperTransport link width to 16 bits.

by Marco Chiappetta



Heavy Silicon

Mainstream Processor, Maximum Performance, Minimal Investment

There are a few ways to choose a processor for a no-nonsense power user's PC, and it all depends on whom you ask. Some will say go with the first step below the flagship processor in the company's CPU lineup. As of this writing, that would mean the Athlon 64 X2 5000+ or the Core 2 Duo E6700. The second fastest processor in Intel's or AMD's current product offerings is usually sold at a considerable discount when compared to the top of the line, but they aren't what one would typically consider cheap. Others will recommend buying the cheapest processor that's in the same product family as the company's current flagship. They argue that these processors come off the same manufacturing line, and with a little overclocking, they'll perform almost as well.

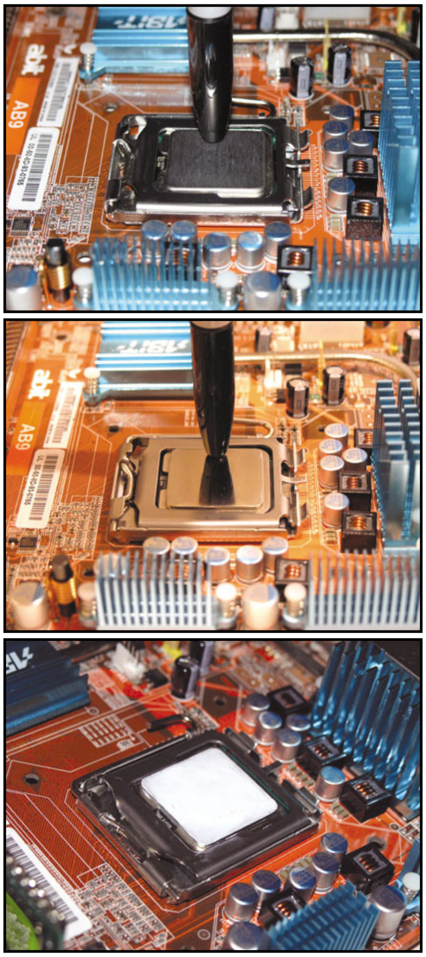
We would like to take yet another approach: The second processors from the top are a bit too expensive for us to consider them practical for this build, and the least expensive processors usually have the lowest multipliers. Low multipliers can make overclocking difficult because some motherboards can't hit FSB or HyperTransport frequencies high enough to excessively tweak the CPU and remain stable. So, for our no-nonsense Intel- and AMD-powered systems, we decided to go with middle-of-the-road processors and overclock them as far as possible. The chips we chose have higher multipliers and are only marginally more expensive than the most affordable processors in their respective lineups, yet they still only cost about a third of the price of Intel's and AMD's current flagships.

Intel Core 2 Duo E6400

There are currently two types of processors in Intel's Core 2 Duo lineup, those with 4MB of L2 cache and those with 2MB. The processors with 4MB of L2 cache are the higher-clocked, more expensive offerings. When clocked at similar frequencies, however, there's only a slight performance difference between the two processors. For our build, a Core 2 Duo with 2MB of cache would suffice, so we went with the Core 2 Duo E6400 ($250) and sprung for a high-performance CPU cooler: the Arctic Cooling Freezer 7 Pro.

In its stock configuration the Core 2 Duo E6400 runs at 2.13GHz. You can get that speed by multiplying the CPU's respective stock multiplier (8) by its FSB frequency (266MHz). By raising either of those values, the processor would run at a higher frequency. The Core 2 Duo, however, isn't unlocked like the Core 2 Extreme, so it's not possible to overclock the chips by raising the multiplier. The only way to overclock a Core 2 Duo is by raising its FSB frequency.

Before we got to the business of overclocking our processor, however, we modded it slightly to help it run a little cooler. We followed essentially the same procedure you can find in the October issue of *CPU* on page 40. Because the



After polishing the Core 2 Duo E6400 processor's integrated heat spreader and our cooler's base, we applied a smooth layer of thermal paste to the CPU.

CPU's integrated heat spreader and our Freezer 7 Pro's copper base were already nice and flat, all we did was use a wadding metal polish to eliminate small peaks and valleys from their surfaces. Doing so makes the surfaces mate better, which aids in heat transfer. This is a quick and easy mod that will usually shave a couple of degrees off a processor's operating temperature, so there's really no reason not to do it—well, except for that voided warranty thing.

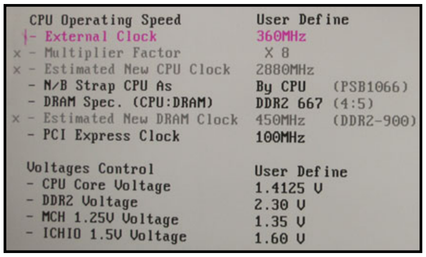
Make The Grade

Once we sufficiently polished our CPU's heat spreader and cooler's base and installed everything, we began overclocking the system via the BIOS. We overclocked the system in multiple steps: First, we disabled whatever integrated peripherals we didn't intend to use and then we locked the motherboard's PCI Express frequency at 100MHz. Doing this will keep the PCI-E links from becoming unstable and potentially prevent an integrated peripheral's failure from hindering our overclocking efforts.

Next we increased all pertinent voltages for the processor, memory, and motherboard chipset. At their default voltages, each of these system components would only overclock to a certain point, but with a little extra juice we could overclock them even further. Because we didn't take any elaborate cooling measures, though, we only bumped up the CPU voltage from 1.35 to 1.41V, our memory voltage to 2.3V, and our MCH (northbridge) and ICH (southbridge) voltages by 0.1V.

Hit The Virtual Wall

After making the necessary voltage changes in the system BIOS, we then began overclocking our processor by increasing its FSB frequency. At first we raised the FSB frequency by about 10MHz at a time until the system was no longer stable and then backed the frequency down 1 to 2MHz until the system stabilized. When all was said and done, we settled on a 360MHz FSB frequency with a final CPU clock speed of 2.88GHz. Our CPU probably had some



```
  CPU Operating Speed          User Define
 |- External Clock             360MHz
x - Multiplier Factor           X 8
x - Estimated New CPU Clock    2880MHz
  - N/B Strap CPU As           By CPU   (PSB1066)
  - DRAM Spec. (CPU:DRAM)      DDR2 667 (4:5)
x - Estimated New DRAM Clock   450MHz   (DDR2-900)
  - PCI Express Clock          100MHz

  Voltages Control             User Define
  - CPU Core Voltage           1.4125 V
  - DDR2 Voltage               2.30 V
  - MCH 1.25V Voltage          1.35 V
  - ICHIO 1.5V Voltage         1.60 V
```

Our processor and motherboard combination peaked at a 360MHz FSB frequency, producing a 2.88GHz CPU clock and a DDR2-900 memory speed.

Performance: Before & After

In its default configuration, the Core 2 Duo E6400 can't hold a candle to Intel's current flagship Core 2 Extreme X6800 processor. The E6400's lower clock speed and smaller L2 cache result in significantly lower benchmark scores in every application. When we overclocked the E6400 to 2.88GHz, however, the combination of higher core and FSB frequencies made the E6400 perform similar to the Core 2 Extreme X6800. Also, a side effect of a higher FSB frequency is additional memory bandwidth, which helps minimize the performance delta between the two processors.

In our benchmarks, which we ran on the Abit P965-based motherboard coupled to a GeForce 7900 GTX and running Windows XP SP2, the overclocked Core 2 Duo E6400 came very close to catching the Core 2 Extreme X6800, which was running on a 975X Express-based motherboard. As you can see from our results, if we were able to squeeze a few more megahertz out of our P965 motherboard and CPU combo, surpassing the performance of the X6800 would have been a possibility. Perhaps with a different motherboard at the heart of the system we would have had better luck, but we're not complaining. ▲

	Stock Clock Speeds Core 2 Duo E6400 at 2.13GHz	**Overclocked Speeds Core 2 Duo E6400 at 2.88GHz**	**Stock Clock Speeds Core 2 Extreme X6800 at 2.93GHz**
SiSoft Sandra 2007 Pro			
Processor Arithmetic			
Dhrystone ALU	19,773Mips	25,963Mips	27,166Mips
Whetstone iSSE3	15,241MFlops	17,921MFlops	18,438MFlops
Processor Multimedia			
Integer x4 aEMMX/aSSE	117,694itps	153,346itps	159,627itps
Floating-Point x4 iSSE2	63,443itps	82,847itps	86,392itps
Memory Bandwidth			
Integer Buffered iSSE2	5,404MBps	6,424MBps	5,607MBps
Floating-Point Buffered iSSE2	5,401MBps	6,419MBps	5,602MBps
LAME MT MP3 Encoding (minutes:seconds)			
Single-threaded	1:04	0:49	0:47
Multithreaded	0:45	0:33	0:32
Cinebench 2003 (seconds)			
Single-threaded	69.9	54.2	51.8
Multithreaded	39.4	29.3	28.4
KribiBench v1.1			
Sponge Explode Model	4.48fps	5.98fps	6.14fps
Ultra Model	1.48fps	1.89fps	1.97fps
F.E.A.R. v1.07			
Low-resolution CPU test (640 x 480, low quality)	221fps	261fps	272fps
Quake 4 v1.2			
Low-resolution CPU test (640 x 480, low quality)	162.4fps	201.8fps	203.5fps

more in the tank, but the affordable Abit P965 motherboard we used for this experiment got flaky once the FSB hit speeds above 3.45MHz or so. There have been reports of the Core 2 Duo E6400 processors hitting above 3GHz, so we may revisit this CPU in the future and couple it with a more overclocker-friendly motherboard.

AMD Athlon 64 X2 4600+

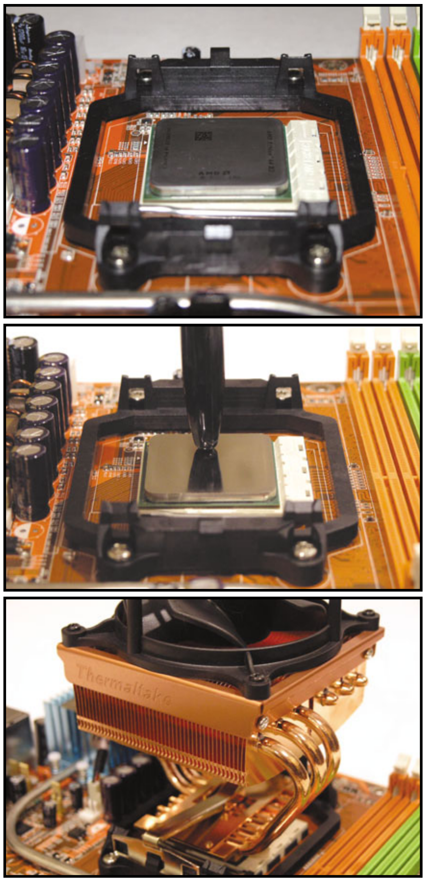
As we already explained in the first half of this article, the components we chose for our practical power user systems had to meet certain criteria. Like our Intel processor, the CPU for our AMD build needed to be significantly more affordable than the company's current flagship Athlon 64 FX-62 processor, but it also had be a good candidate for overclocking. After a bit of searching, we decided to go with AMD's Athlon 64 X2 4600+. The price cuts AMD made prior to Intel's introduction of the Core 2 Duo put the standard edition Athlon 64 X2 4600+ into sub-$250 territory, which made this 2.4GHz CPU a good candidate. We should note that AMD also offers an energy-efficient version of the X2 4600+ that would have worked just as well for this build, but it's about 20% more expensive. (You can tell the difference between AMD's energy-efficient processors and their "normal" counterparts by their model numbers. The third digit of the processor's part number details the maximum power consumption of that model: A denotes "normal" power, O indicates a 65W energy-efficient processor, and D signifies a 35W energy-efficient, SFF processor.)

Performance: Before & After

Our Athlon 64 X2 4600+ processor proved to be a decent overclocker when coupled to Abit's nForce 570 SLI powered KN9 SLI motherboard and the Thermaltake Mini Typhoon. With some mild voltage increases and a higher HT frequency, we took our X2 4600+ to almost 2.9GHz, which was enough of a boost to overtake AMD's current flagship Athlon 64 FX-62 processor in our benchmarks.

We tested the processor on Abit's KN9 SLI with a single GeForce 7900 GTX in one of its graphics slots and Windows XP Professional with SP2 installed on its drive. Despite having a smaller L2 cache (512 vs. 1MB per core), the overclocked Athlon 64 X2 4600+ outpaced the FX-62 in every benchmark we ran, thanks to a slightly higher core frequency and an increase in memory bandwidth resulting from the higher HT link's speed. ▲

	Stock Clock Speeds Athlon 64 X2 4600+ at 2.4GHz	**Overclocked Speeds Athlon 64 X2 4600+ at 2.84GHz**	**Stock Clock Speeds Athlon 64 FX-62 at 2.8GHz**
SiSoft Sandra 2007 Pro			
Processor Arithmetic			
Dhrystone ALU	17,321Mips	21,265Mips	20,411Mips
Whetstone iSSE3	14,632MFlops	17,864MFlops	17,230MFlops
Processor Multimedia			
Integer x4 aEMMX/aSSE	45,126itps	53,593itps	52,936itps
Floating-Point x4 iSSE2	48,824itps	58,076itps	57,642itps
Memory Bandwidth			
Integer Buffered iSSE2	8,174MBps	9,438MBps	8,500MBps
Floating-Point Buffered iSSE2	8,164MBps	9,422MBps	8,464MBps
LAME MT MP3 Encoding (minutes:seconds)			
Single-threaded	1:23	1:09	1:11
Multithreaded	0:54	0:44	0:47
Cinebench 2003 (seconds)			
Single-threaded	77	66.1	66.3
Multithreaded	41.3	35.2	35.4
KribiBench v1.1			
Sponge Explode Model	4.46fps	5.22fps	5.14fps
Ultra Model	1.27fps	1.51fps	1.47fps
F.E.A.R. v1.07			
Low-resolution CPU test (640 x 480, low quality)	213fps	252fps	248fps
Quake 4 v1.2			
Low-resolution CPU test (640 x 480, low quality)	145.2fps	178.2fps	169.1fps



We polished our Athlon 64 X2 4600+ processor's heat spreader before applying a high-quality thermal paste and installing the Thermaltake Mini Typhoon CPU cooler.

Prep The Hardware

To get our Athlon 64 X2 4600+ ready for tweaking, we gave it the same treatment as our Core 2 Duo E6400. Its integrated heat spreader was nice and flat, so we simply used a wadding metal polish to buff it to a mirror-like shine. The Thermaltake Mini Typhoon that we used to keep the processor cool already had a perfectly polished base, however, so we didn't have to touch it. Although it works well, we decided to forego AMD's stock PIB (processor-in-a-box) cooler in favor of the Mini Typhoon for a couple of reasons. For one, the Mini Typhoon performs better than AMD's PIB. The Mini Typhoon's also quieter than the stock cooler and its design helps blow plenty of air over our motherboard's VRM and the system RAM—two things that should help stabilize the system while overclocking.

The Overclock

Unlike the Core 2 Duo E6400, the Athlon 64 X2 4600+'s multiplier is slightly unlocked. You can specify multipliers lower than stock; AMD does not allow higher multipliers, though. This opens up some interesting possibilities for tweaking overall system performance by utilizing a lower multiplier with higher HyperTransport and memory frequencies, but that's a discussion we'll have to cover someday in another article. Our goal for this build was to hit the highest, fully-stable processor frequency possible. That meant sticking with the X2 4600+ processor's 12X multiplier and raising the HT reference clock as high as possible.

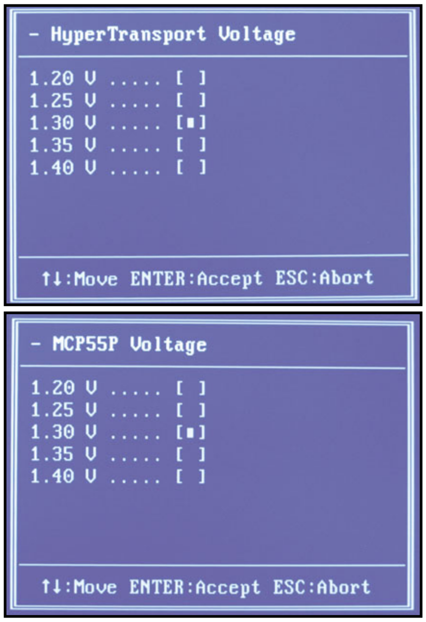
To help us achieve our goal, we had to alter a couple of BIOS settings before tweaking the CPU. As you'd expect, raising the HT reference clock results in a higher-clocked HyperTransport link. Some processors and motherboards will no longer be stable at a certain point, though, so before taking the processor any higher, we decided to drop the HT multiplier from 5X to 4X. Changing the HT multiplier to 4X set the link speed to 800MHz, giving us some room to work. We also dialed the PCI-E clock to 100MHz to prevent pushing the PCI-E interface out of spec. And finally, we cranked the processor's voltage up from 1.35 to 1.5V and set the memory, HyperTransport, and chipset voltages to 2.3, 1.3, and 1.3V, respectively.

All She Wrote

With all of the preparation done, we slowly began raising the 200MHz default HT reference clock speed until the system became unstable. We increased the speed a few megahertz at a time and ultimately settled upon a 237MHz reference clock with a final CPU clock speed of 2.84GHz. The system actually booted at higher speeds but couldn't make it through our suite of benchmarks without crashing, so we backed off a bit and stabilized the system at 237MHz.

A CPU clock speed of 2.84GHz is about an 18.5% increase over the Athlon 64 X2 4600+'s default 2.4GHz frequency; enough of a boost to put it past the flagship Athlon 64 FX-62. Not bad for a $250 processor. With more exotic cooling and perhaps a bit more voltage, we suspect frequencies higher than 2.9GHz are a possibility with the Athlon 64 X2 4600+, but we're pleased with these results. Our processor and motherboard combination played very well together and it definitely showed in our benchmarks. ▲

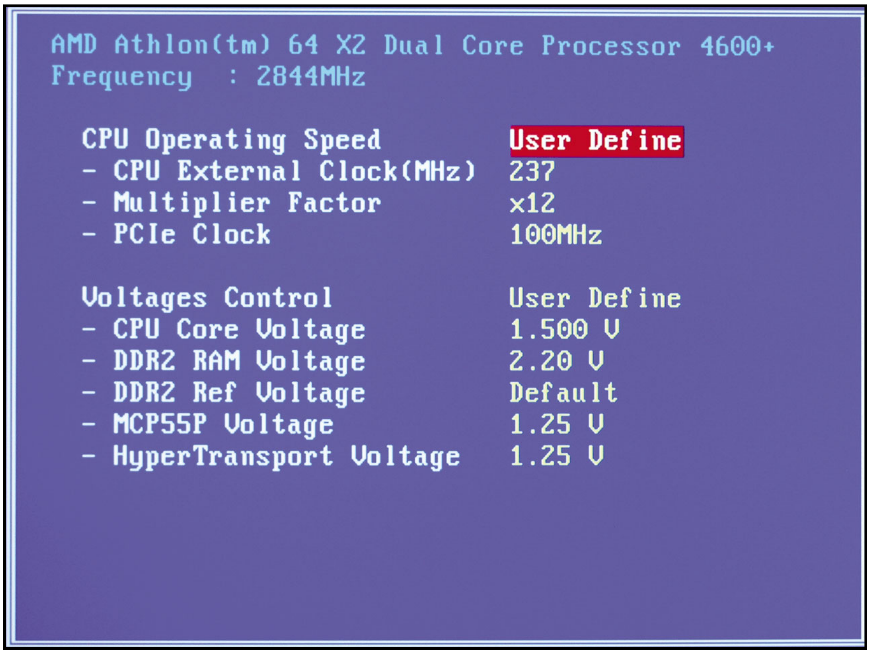
by Marco Chiappetta



```
- HyperTransport Voltage

1.20 V ..... [ ]
1.25 V ..... [ ]
1.30 V ..... [■]
1.35 V ..... [ ]
1.40 V ..... [ ]

↑↓:Move ENTER:Accept ESC:Abort
```

```
- MCP55P Voltage

1.20 V ..... [ ]
1.25 V ..... [ ]
1.30 V ..... [■]
1.35 V ..... [ ]
1.40 V ..... [ ]

↑↓:Move ENTER:Accept ESC:Abort
```

Raising the motherboard's HyperTransport and chipset voltages will usually help them remain stable at higher frequencies.

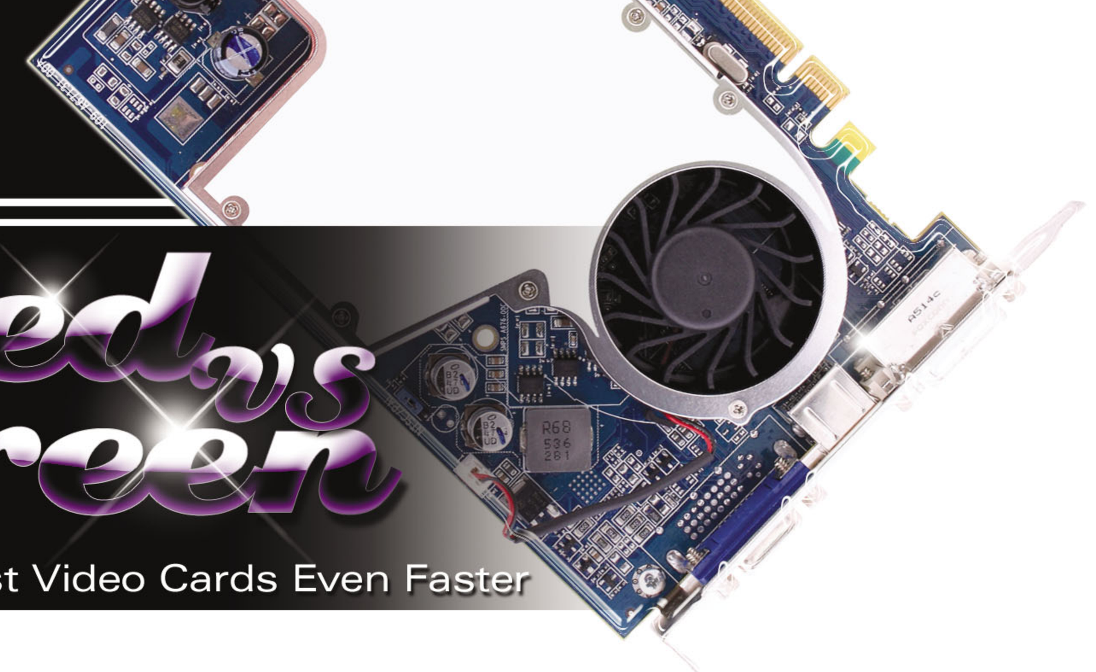


```
AMD Athlon(tm) 64 X2 Dual Core Processor 4600+
Frequency   : 2844MHz

  CPU Operating Speed          User Define
  - CPU External Clock(MHz)    237
  - Multiplier Factor          x12
  - PCIe Clock                 100MHz

  Voltages Control             User Define
  - CPU Core Voltage           1.500 V
  - DDR2 RAM Voltage           2.20 V
  - DDR2 Ref Voltage           Default
  - MCP55P Voltage             1.25 V
  - HyperTransport Voltage     1.25 V
```

By increasing our processor's core voltage and tweaking memory and chipset voltages, we were able to raise the HT frequency to 237MHz with a peak CPU clock of almost 2.9GHz.

Red vs Green

Make Fast Video Cards Even Faster



Never before have power users had more video cards to choose from than today. Ever since ATI and Nvidia started designing scalable architectures a few years ago, both companies have produced entire lines of products with virtually the same features. The only factor that seems to set these products apart is performance.

The Red Team: ATI Radeon X1900 XT

Currently playing for the Red Team is an extensive cast of GPUs derived from the R5x0 architecture. Every live product in ATI's current group, from the entry-level X1300 to the flagship X1950, fully supports Shader Model 3.0, the Avivo video engine, and Cross-Fire. Depending on your particular needs, one of the cards in ATI's current lineup is likely to be a good fit.

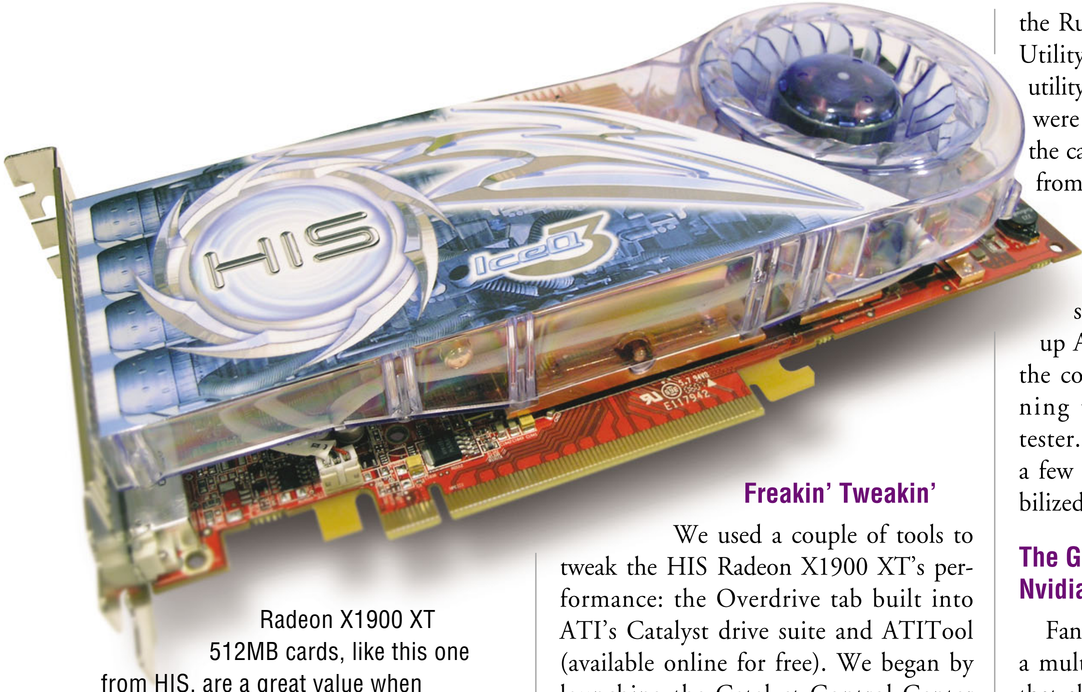
With that in mind, we searched for the best value in ATI-based graphics cards in terms of features and performance for this month's sensible power user build. We knew that we wanted a 512MB frame buffer for better performance at higher resolutions when using antialiasing and anisotropic filtering. And we also wanted something with 48 shader processors similar to the flagship X1950 XTX. The only card that fit these criteria that also happened to be considerably less expensive is the 512MB Radeon X1900 XT. For a time you could buy these cards for more than $500, but with the release of the X1950 XTX, prices on X1900 XTs have dropped to about $300. And, other than having a different cooler and PCB, the only major differences between a 512MB Radeon X1900 XT and a Radeon X1950 XTX are their respective GPU and memory clock speeds. But we can minimize those differences with a bit of overclocking.

Red Team Performance: Before & After

We tested our tweaked Radeon X1900 XT card on an Abit KN9 SLI motherboard powered by 2GB of OCZ DDR2 PC2-8000 RAM and an Athlon 64 X2 4600+ processor overclocked to 2.88GHz. The rest of the major system components included a Western Digital Raptor 74GB hard drive, an LG DVD optical drive, and a 550W Sunbeam NUUO SLI-certified PSU. We also installed Windows XP Professional with SP2 and the August DirectX 9 redistribution on the machine along with ATI's Catalyst v6.8 drivers.

As you can see, the 44MHz increase in the GPU clock speed actually made our X1900 XT's core run a bit faster than an X1950 XTX. The 120MHz increase in memory speed, however, couldn't even come close to the 2GHz the X1950 XTX's GDDR4 memory offers. In the end, the performance deltas separating the two cards in our benchmarks were relatively small—so small, in fact, that it's very difficult to justify spending additional money on an X1950 XTX. ▲

	HIS Radeon X1900 XT Stock 625MHz/1.45GHz	**HIS Radeon X1900 XT Overclocked 669MHz/1.57GHz**	**ATI Radeon X1950 XTX 650MHz/2GHz**
F.E.A.R. v1.07			
1,280 x 960 (4XAA/16XAF)	67fps	71fps	75fps
1,600 x 1,200 (4XAA/16XAF)	48fps	53fps	56fps
Half Life 2: Episode 1			
1,280 x 1,024 (4XAA/16XAF)	85.16fps	88.36fps	93.41fps
1,600 x 1,200 (4XAA/16XAF)	63.31fps	70.31fps	72.12fps
Prey			
1,280 x 1,024 (4XAA/16XAF)	69.9fps	78.4fps	81.46fps
1,600 x 1,200 (4XAA/16XAF)	55.2fps	62.7fps	64.3fps
Far Cry v1.33			
1,280 x 1,024 (4XAA/16XAF)	99.51fps	105.06fps	109.66fps
1,600 x 1,200 (4XAA/16XAF)	83.43fps	92.67fps	96.9fps
3DMark06 — Overall Score			
1,280 x 1,024 (no AA/AF)	5541	6224	6643



Radeon X1900 XT 512MB cards, like this one from HIS, are a great value when compared to their more expensive and only slightly faster counterparts.

Choose The Card

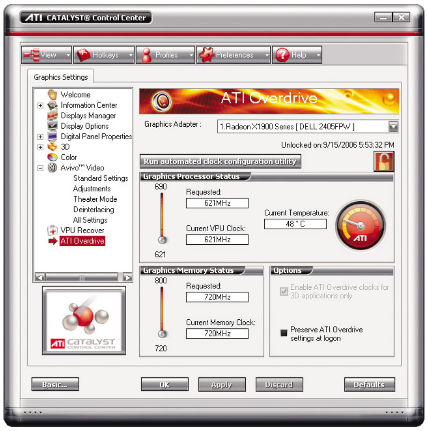
There are a number of 512MB Radeon X1900 XT cards available from a few of ATI's various board partners. Because we were planning to do some overclocking, though, we thought it would be best to pick a card that had an enhanced cooling apparatus. HIS' card that features the IceQ 3 cooler seemed like a great candidate. The card is competitively priced and the IceQ 3 cooler is superior to ATI's stock solution in a couple of ways. First, the IceQ 3 features heatpipes and all-copper heatsinks to absorb heat from the GPU and memory. The card's heatsinks are isolated, which means the memory and GPU heatsinks are completely separate, preventing any heat transfer from the GPU to memory or vice versa. The all-copper heatsinks are also larger than ATI's reference design, which should help keep temperatures down.

The fan and shroud the IceQ 3 uses is also different from ATI's stock design. The IceQ 3 features bidirectional air intake channels that draw in cool air from both sides of the fan, improving air flow. The fan itself is also much quieter than the stock model (less than 20dB), which is another plus.

Freakin' Tweakin'

We used a couple of tools to tweak the HIS Radeon X1900 XT's performance: the Overdrive tab built into ATI's Catalyst drive suite and ATITool (available online for free). We began by launching the Catalyst Control Center and navigating to the Overdrive tab. Once there, we clicked the unlock icon to enable the clock configuration utility and then the Run Automated Clock Configuration Utility button. After a few minutes, the utility determined that 649MHz/1.5GHz were the optimal clock frequencies for the card's GPU and memory, an increase from 620MHz/1.44GHz.

This automated utility tends to err on the side of caution, however, so we used those frequencies strictly as a starting point. We fired up ATITool and continued to increase the core and memory clocks while running the program's built-in artifact tester. After some experimentation and a few system hangs, the card finally stabilized at 669MHz/1.57GHz.



Graphics Adapter : 1.Radeon X1900 Series [DELL 2405FPW]

Unlocked on:9/15/2006 5:53:32 PM

Requested: 621MHz

Current VPU Clock: 621MHz

Current Temperature: 48 ° C

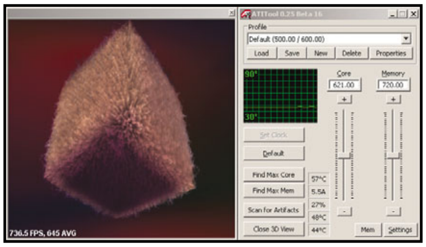
Requested: 720MHz

Current Memory Clock: 720MHz

☑ Enable ATI Overdrive clocks for 3D applications only

■ Preserve ATI Overdrive settings at logon

The place to start when overclocking is the Overdrive menu in ATI's Catalyst Control Center.



Profile: Default (500.00 / 600.00)

Core: 621.00

Memory: 720.00

57°C

5.5A

27%

48°C

44°C

736.5 FPS, 645 AVG

ATITool will incrementally increase GPU core and memory frequencies while simultaneously checking for visual artifacts.

The Green Team: Nvidia GeForce 7950 GT

Fans of Nvidia's graphics cards also have a multitude of products to choose from that all have similar features. In fact, one could argue that Nvidia's product stack is segmented in such a way that it may be even more difficult to find the "sweet spot" in the company's lineup. Nvidia has about seven different product families with prices ranging from less than $90 to more than $500, and each of those families has multiple products within them.

Pick A Winner

We approached the Nvidia product selection process with the same criteria in mind that we used for the ATI-based card. We wanted a GeForce card that had the same number of pixel shader processors as the company's flagship single GPU card, the GeForce 7900 GTX, and it had to have a 512MB frame buffer and "better than stock" cooling. We decided on

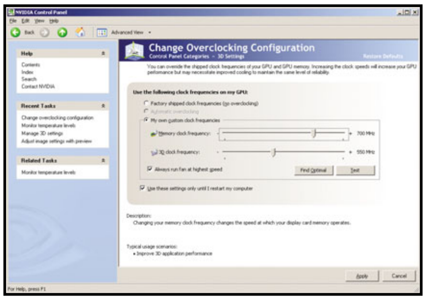
The relatively new GeForce 7950 GT offers all of the features and about 90% of the performance of a GeForce 7900 GTX for under $300.

Green Team Performance: Before & After

We tested our overclocked GeForce 7950 GT card on the same platform we used for the Radeon X1900 XT, which consisted of an Abit KN9 SLI motherboard, 2GB of PC2-8000 RAM, and an Athlon 64 X2 4600+ processor overclocked to 2.88GHz. Once again, we installed Windows XP Professional with SP2 and the August DirectX 9 redistribution on the machine, but we used Nvidia's ForceWare v91.45 drivers with the GeForce cards.

The 51MHz and 180MHz increase in GPU core and memory clock frequencies produced some nice performance gains for our tweaked GeForce 7950 GT card, but it wasn't quite able to catch the higher-clocked GeForce 7900 GTX. Regardless, while overclocked the GeForce 7950 GT trailed the more expensive GTX by only a few frames per second in each benchmark. That's money well saved in our book. ▲

	GeForce 7950 GT Stock 550 MHzn / 1.4GHz	GeForce 7950 GT Overclocked 601MHz / 1.58GHz	GeForce 7900 GTXn 650 MHz / 1.6GHz
F.E.A.R. v1.07			
1,280 x 960 (4XAA/16XAF)	59fps	64fps	68fps
1,600 x 1,200 (4XAA/16XAF)	41fps	45fps	49fps
Half Life 2: Episode 1			
1,280 x 1,024 (4XAA/16XAF)	77.72fps	82.63fps	86.82fps
1,600 x 1,200 (4XAA/16XAF)	58.39fps	63.39fps	66.43fps
Prey			
1,280 x 1,024 (4XAA/16XAF)	65.3fps	71.2fps	75.8fps
1,600 x 1,200 (4XAA/16XAF)	50.6fps	54.7fps	56.9fps
Far Cry v1.33			
1,280 x 1,024 (4XAA/16XAF)	93.46fps	96.16fps	99.13fps
1,600 x 1,200 (4XAA/16XAF)	69.88fps	75.87fps	79.47fps
3DMark06 — Overall Score			
1,280 x 1,024 (no AA/AF)	5374	5997	6249



You can override the shipped clock frequencies of your GPU and GPU memory. Increasing the clock speeds will increase your GPU performance but may necessitate improved cooling to maintain the same level of reliability.

Use the following clock frequencies on my GPU:

○ Factory shipped clock frequencies (no overclocking)

○ Automatic overclocking

● My own custom clock frequencies

Memory clock frequency: 700 MHz

3D clock frequency: 550 MHz

☑ Always run fan at highest speed

☑ Use these settings only until I restart my computer

Description:
Changing your memory clock frequency changes the speed at which your display card memory operates.

Typical usage scenarios:
- Improve 3D application performance

Nvidia's ForceWare drivers can help determine a GeForce card's maximum stable overclock.

XFX's GeForce 7950 GT 570M Extreme. The card is available for a little more than $300 online and it met all of our standards. The XFX GeForce 7950 GT 570M Extreme's most intriguing feature has to be its cooler. XFX has outfitted this card with a low-profile passive cooler, meaning no fan and no noise. The manufacturer mounts a large, aluminum heatsink to the GPU and memory on the front side of the PCB, and two heatpipes connect the front heatsink assembly to an array of thin aluminum cooling fins on the back. By itself, the passive cooler may seem like a downgrade from an active cooler, but by positioning a case fan directly at the fins, cooling performance is superior to any stock configuration.

We should also note that the GeForce 7950 GT has essentially the same features as the more powerful GeForce 7900 GTX but with lower clock speeds. Both cards feature 24 pixel pipes, 16 ROPs, and 8 vertex shaders. Nvidia's reference specifications call for a 550MHz GPU clock with 1.4GHz memory; however, the XFX card we chose was clocked higher at 570MHz GPU and1.46GHz memory.

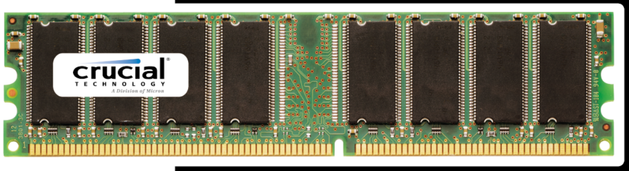
Let The Tweaking Begin

We started the tweaking process by first entering the Coolbits Registry hack to enable the clock frequency sliders within Nvidia's ForceWare driver. To start Coolbits click Start, Run, type **regedit** in the Open field, and click OK. Next, go to the HKEY_LOCAL_MACHINE\SOFTWARE\NVIDIA CORPORATION\GLOBAL\NVTWEAK entry. Now, right-click the Name column and select New and then DWORD Value. Replace New Value #1 by typing in **Coolbits** in the name field. Finally, double-click the new Coolbits entry and type **1A** in the Value Data field to unlock advanced features and overclocking abilities. This process can get to be a pain every time you upgrade drivers, so create a text file with a .REG extension and simply double-click it when the need arises.

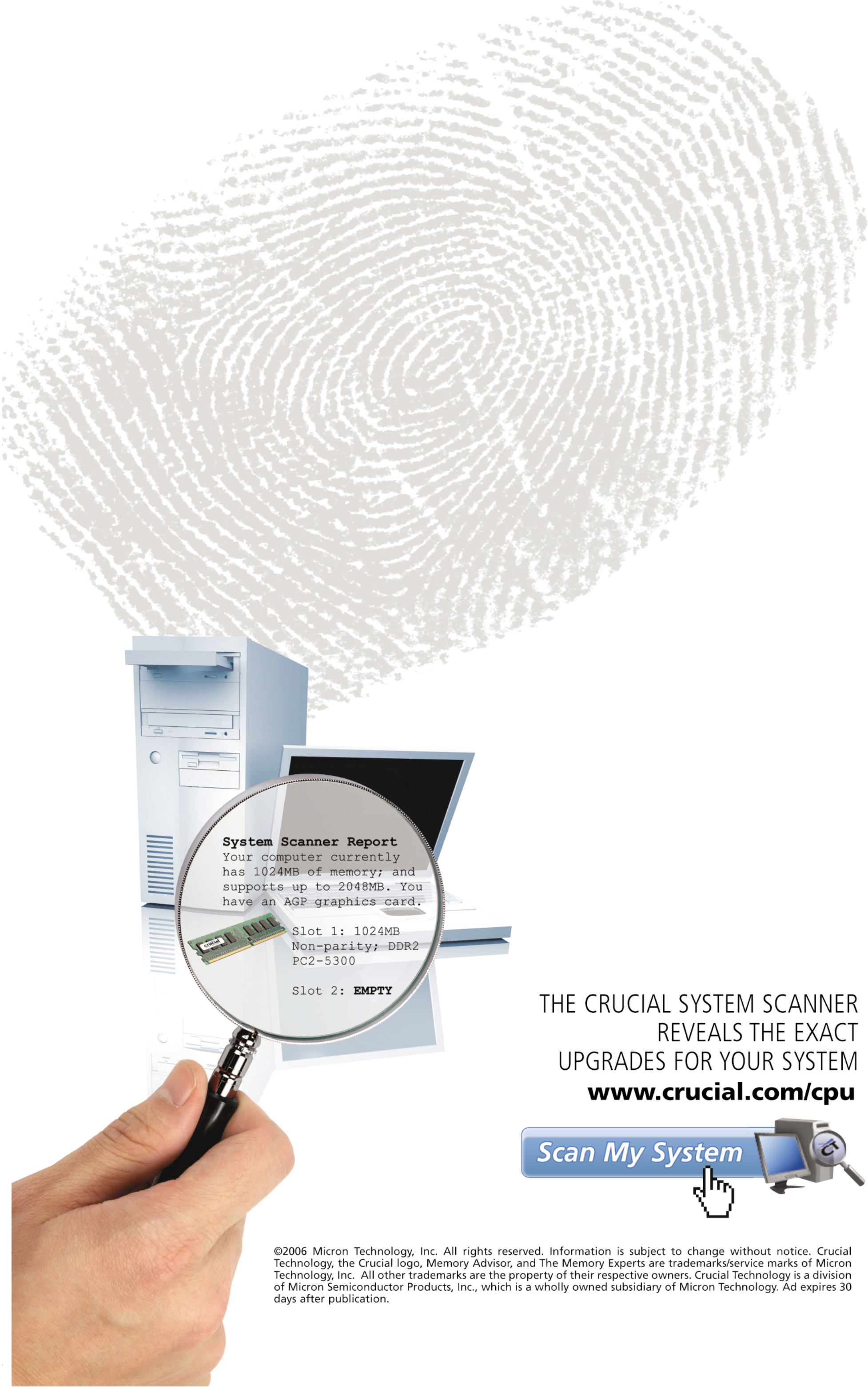
With Coolbits enabled, we headed into the driver control panels and browsed to the Change Overclocking Configuration menu. As its name implies, the Change Overclocking Configuration menu is where you can tweak your card's GPU and memory clock speeds. Once in the menu, select My Own Custom Clock Frequencies and then click the Find Optimal button. After clicking through a couple of warning messages, the card's GPU and memory clock speeds will gradually increase until the utility determines a maximum stable value. The automated utility reported that a 596MHz GPU clock and a 1.57GHz memory clock was as high as the card could go.

However, as we mentioned earlier, automated tools tend to be a bit conservative with their recommendations, so we fired up the free RivaTuner utility to see if we could take the card's GPU and memory clock speeds even higher. In the System Tweaks section of RivaTuner, we slowly increased our 7950 GT's GPU and memory clocks until we maxed out at 601MHz/1.58GHz. It seems Nvidia's automated utility wasn't that far off after all. ▲

by Marco Chiappetta



MEMORY MYSTERY SOLVED,CASE CLOSED.



```
System Scanner Report
Your computer currently
has 1024MB of memory; and
supports up to 2048MB. You
have an AGP graphics card.

Slot 1: 1024MB
Non-parity; DDR2
PC2-5300

Slot 2: EMPTY
```

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UPGRADES FOR YOUR SYSTEM

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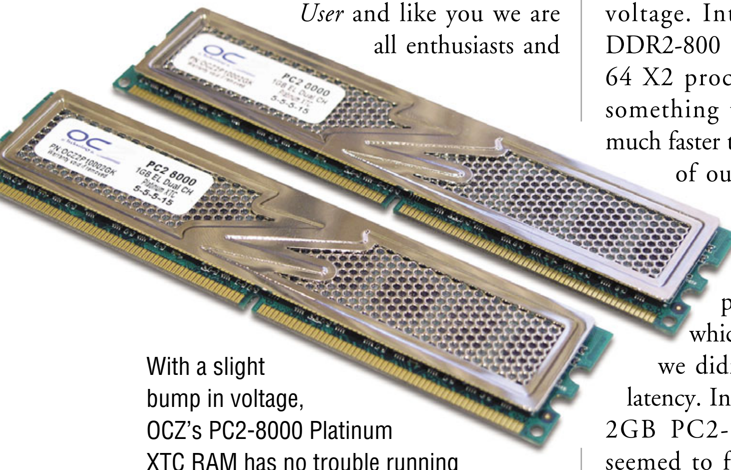
Total Recall

Jog Your Memory

Choosing system memory for a new build can sometimes be a daunting task, especially if you're an enthusiast on a budget. Video cards based on the same GPU tend to be priced similarly, and prices don't fluctuate too drastically from one reputable retailer to another for the same processors, hard drives, or motherboards. But if you're in the market for a decent 2GB dual-channel DDR2 memory kit, prices range from less than $200 to more than $600 depending on the kit's rated frequency, latencies, and its particular cooling apparatus. That's a huge spread for a family of products that do essentially the same thing.

As is always the case, striking the right balance is the key: Finding the right combination of capacity, frequency, and timings is the trick to choosing the right memory kit for a practical power user's system. Because this is *Computer Power User* and like you we are all enthusiasts and gamers around here, we focused on finding a relatively affordable, high-performing 2GB dual-channel DDR2 memory kit that would give us some flexibility for overclocking. As of this writing, Corsair's Dominator TWIN2X2048-8888C4DF kit, which can run at speeds in excess of 1.1GHz with 4-4-4-12 timings at 2.4V, is arguably the fastest memory available in terms of frequency and latency. All that speed comes at a price, however, as Corsair's current flagship desktop memory also commands a price upwards of $600. In addition to the exorbitant price, some mainstream motherboards don't support the relatively high voltage the TWIN2X2048-8888C4DF kit requires to keep running reliably at its rated speed.



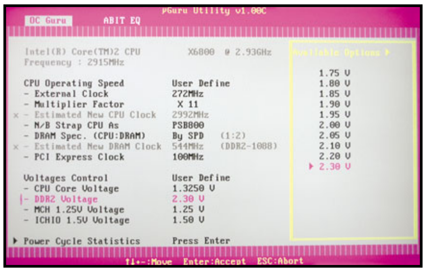
With a slight bump in voltage, OCZ's PC2-8000 Platinum XTC RAM has no trouble running at frequencies above 1GHz.

Enter OCZ

Instead of shooting right for the top and spending a ton of cash, we looked for a more affordable memory kit—relatively speaking—that would run at frequencies higher than 800MHz at a modest to low voltage. Intel and AMD recommend DDR2-800 for Core 2 Duo and Athlon 64 X2 processors, so we shopped for something that would be able to run much faster than this. We know from one of our memory roundups in the August 2006 issue of *CPU* (page 62) that latency had a smaller impact on performance than frequency, which translates to bandwidth, so we didn't focus much on the kit's latency. In the end, OCZ Technology's 2GB PC2-8000 Platinum XTC kit seemed to fit the bill nicely. At about $350, this kit consists of a pair of matched 1GB DIMMs guaranteed to run at 1GHz with 5-5-5-15 timings at 2.1V. That's a nice 25% increase over DDR2-800 at a relatively manageable voltage. But we all know that with a little extra juice and some BIOS tweaking, even higher frequencies and tighter timings are a definite possibility.

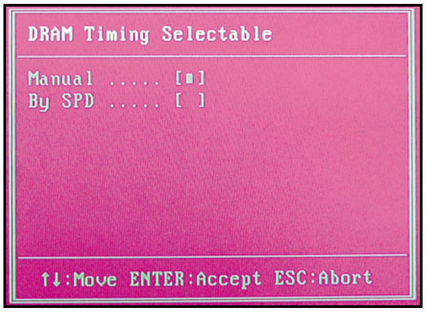
Commence Tweaking

To see just how high we could take OCZ's PC2-8000 kit, we first entered the system BIOS on our Abit AB9 motherboard and raised the DDR2 memory voltage to 2.3V—a modest 0.2V increase over stock. Then we configured the memory clock manually to DDR2-800 (some motherboards list the memory frequency as a ratio, you'll need to lock in the option to the ratio



```
Intel(R) Core(TM)2 CPU        X6800  @ 2.93GHz
Frequency : 2915MHz

CPU Operating Speed           User Define
 - External Clock             272MHz
 - Multiplier Factor           X 11
x - Estimated New CPU Clock   2992MHz
 - N/B Strap CPU As           PSB800
 - DRAM Spec. (CPU:DRAM)      By SPD    (1:2)
x - Estimated New DRAM Clock  544MHz    (DDR2-1088)
 - PCI Express Clock          100MHz

Voltages Control              User Define
 - CPU Core Voltage           1.3250 V
 - DDR2 Voltage               2.30 V
 - MCH 1.25V Voltage          1.25 V
 - ICHIO 1.5V Voltage         1.50 V

▶ Power Cycle Statistics      Press Enter

1.75 V
1.80 V
1.85 V
1.90 V
1.95 V
2.00 V
2.05 V
2.10 V
2.20 V
▶ 2.30 V

↑↓+-:Move  Enter:Accept  ESC:Abort
```

Even affordable enthusiast-class motherboards should have a memory voltage option available in their BIOS. Bumping up the voltage to 2.3V should be enough for some moderate to aggressive overclocking, depending on the modules.



```
DRAM Timing Selectable

Manual ..... [■]
By SPD ..... [ ]

↑↓:Move ENTER:Accept ESC:Abort
```

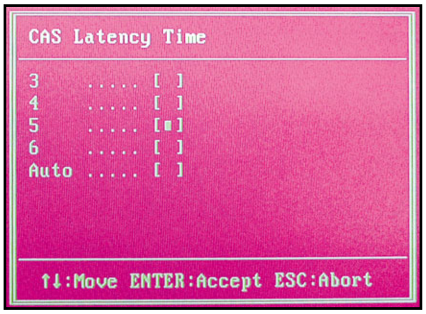
It's best to manually set your memory's clock frequency to maintain as much control as possible over clock speeds and timings.

you desire on these boards). If this setting is left on Auto as you raise the FSB frequency on most Intel motherboards (or the HT link frequency on AMD boards), the memory divider may change in an effort to keep the memory clock as close to its default speed as possible. By manually dialing in this setting, however, the memory clock speed will increase in lockstep with the FSB frequency, so a higher FSB means a higher memory clock. With an unlocked processor and a highly overclockable motherboard, this could give you the ability to run your processor and memory synchronously in 1:1 ratio for the utmost performance. Unfortunately, the modestly priced Intel P965-based Abit AB9 motherboard we were using was not stable at ultra-high FSB speeds, so we settled on a 2:3 FSB frequency to memory speed ratio.

Find The Sweet Spot

Once we increased the voltage and locked in the memory frequency, we tested to see what the OCZ PC2-8000 Platinum XTC kit could do in our rig. For this stage of our testing, we installed a Core 2 Extreme X6800 processor into the system to alter the CPU multiplier and focus on overclocking the memory alone without fear of hitting any limits with our motherboard, processor, or any other components. With 2.3V feeding it, the memory actually had no troubling running with 5-4-4-12 timings at 800MHz, so lower latencies were a possibility if we wanted to go that route. We wanted to focus on increasing available bandwidth, however, so we put the timings back to 5-5-5-15 and raised our FSB speed while simultaneously lowering our processor's multiplier until we hit the memory's clock speed ceiling. When we were done with our experiments, we were actually able to take the memory to about 1.1GHz. The system wasn't completely rock-solid with the memory clock set that high, though, so we backed things down and found 1,066MHz to be the sweet spot. At that speed, Prime95 didn't generate a single error and all of our benchmarks ran without any issues. ▲

by Marco Chiappetta



```
CAS Latency Time

3     ..... [ ]
4     ..... [ ]
5     ..... [■]
6     ..... [ ]
Auto  ..... [ ]

↑↓:Move ENTER:Accept ESC:Abort
```

Lower latencies equate to better performance, but most modules can't run at lower latencies when you're overclocking them beyond their rated specifications.

Performance & Stability Testing

To ensure our memory was completely stable and performing as it should at its overclocked settings, we ran a handful of benchmarks on our Intel P965-based test bed and compared our results to Corsair's current flagship Dominator TWIN2X2048-8888C4DF memory kit. For these tests we used an unlocked Core 2 Extreme X6800 processor and altered the memory clock speed by raising the system's FSB speed. To keep the processor as close to its stock speed as possible and to isolate memory performance, we also lowered its multiplier as we raised the FSB frequency.

For these tests we manually configured the memory timings on the OCZ PC2-8000 Platinum XTC modules to their rated settings of 5-5-5-15 (CAS Latency = 5T, RAS to CAS Delay [tRCD] = 5T, Row Precharge [tRP] = 5T, Active to Precharge Delay [tRAS] = 15T) and ran the benchmarks with the memory running at three different frequencies: 800, 1,000, and 1,066MHz. Here are the memory frequencies we attained by running the CPU in three different configurations with a 2:3 FSB to memory speed ratio:

DDR2-800: 11 x 266MHz = 2,926MHz CPU Clock
DDR2-1,000: 9 x 334MHz = 3,006MHz CPU Clock
DDR2-1,066: 8 x 356MHz = 2,848MHz CPU Clock
DDR2-1,111: 8 x 370MHz = 2,960MHz CPU Clock (Corsair Kit)

As you can see from the results, our OCZ PC2-8000 memory performed only slightly lower than the more expensive Corsair Dominator kit, even though it's running with higher latencies and at a slightly lower frequency. Moving from 800 to 1,000MHz netted approximately 1.4GBps of additional bandwidth according to Sandra, and our PCMark05 Memory score went up by 825 points. F.E.A.R., however, didn't benefit much from the increased bandwidth. Going from 1,000 to 1,066MHz produced only modest gains in performance, but it brought our kit to within striking distance of the more expensive Corsair Dominators. ▲

	OCZ PC2-8000 Platinum XTC DDR2-800 (by SPD)	**OCZ PC2-8000 Platinum XTC DDR2-1,000 / 5-5-5-15**	**OCZ PC2-8000 Platinum XTC DDR2-1,066 / 5-5-5-15**	**Corsair Dominator TWIN2X2048-8888 C4DF DDR2-1,111 / 4-4-4-12**
SiSoft Sandra 2007 Pro				
Memory Bandwidth Benchmark				
Integer Buffered iSSE2	5,640MBps	7,010MBps	7,120MBps	7,314MBps
Floating-Point Buffered iSSE2	5,638MBps	7,006MBps	7,119MBps	7,302MBps
Futuremark PCMark05				
Memory Performance Module	5887	6712	6791	6894
F.E.A.R. v1.07				
1,024 x 786 low quality	202fps	204fps	205fps	208fps

The Economics of Power

Our Thrifty Titans Challenge The Budget Busters

The obvious question when you start to talk about assembling a Practical Power User PC is how much money you can really save? We've shown in the previous several articles that it's entirely feasible to build a high-performance system using modestly priced components, but what is the bottom line?

For the purpose of comparison, we'll compare the parts we used in building our PPUPCs to the cost of the components in the ultimate AMD and Intel builds we put together in our August and September issues. We gleaned the prices for all components involved, including those from the past issues, from Newegg.com or (in one case) a similar site at press time.

As you can see, in either case we saved around $1,000 on core components alone. Obviously, there are other costs involved, such as a case, PSU, cooling equipment, hard drives, etc., and each of these parts is an opportunity to save even more cash on your rig. Also note that comparing the performance of our PPUPC platforms to that of our ultimate builds isn't quite apples-to-apples because both of our ultimate systems were configured for SLI, which would potentially add another $475 to the cost of our ultimate builds (or at least roughly double the video card savings in the event that you run a two-card config in your PPUPC). In addition, if we rebuilt our ultimate builds today, we'd quite possibly spend more on video cards, so that makes the real savings on our sensible systems even better.

In any event, a grand is a grand, and if you can save that kind of money and still get a PC that will handle all your high-end computing needs (including cutting-edge games), you'll be one step closer to achieving true power userness. ▲

by Chris Trumble

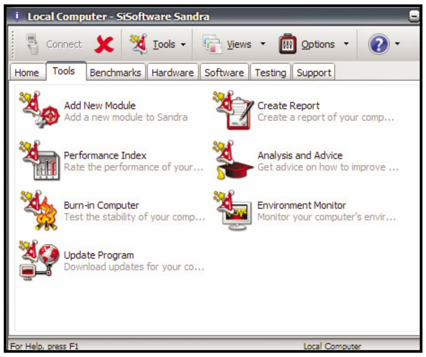
	Savings	CPU	Video Card(s)	Memory	Total Savings
Ultimate Conroe Build	Asus P5N32-SLI SE ($219)	Core 2 Extreme X6800 ($975)	XFX GeForce 7900 GTX 512MB ($475)	Corsair TWIN2X2048-6400C3 2B DDR2 ($453)	
Intel PPUPC	Abit AB9 Intel P965 ($135)	Core 2 Duo E6400 ($227)	XFX GeForce 7950 GT ($337)	OCZ PC2-8000 Platinum XTC DDR2-800 ($385)	
Savings	$84	$748	$138	$68	**$1,038**
Ultimate AM2 Build	Foxconn C51XEM2AA nForce 590 ($190)	Athlon 64 FX-62 ($811)	XFX GeForce 7900 GTX 512MB ($475)	Corsair TWIN2X2048-6400C3 2B DDR2 ($453)	
AMD PPUPC	Abit KN9 nForce 570 ($75)	Athlon 64 X2 4600+ ($247)	HIS Radeon X1900 XT ($279)	OCZ PC2-8000 Platinum XTC DDR2-800 ($385)	
Savings	$115	$564	$196	$68	**$943**

Top 10 Performance Utilities

Because Hardware Alone Is Just Metal & Sand

Creating a high-performance rig (especially a practical one) takes more than just throwing down your credit card and purchasing the components you need to boot Windows. Making a system truly run at its best requires countless hours of tweaking and experimenting with different settings to wring every last bit of performance from each individual component. Thankfully, there are a multitude of applications available to assist power users in their high-performance computing endeavors; here's a quick look at a decade of our favorites.

SiSoftware SANDRA 2007 SP1

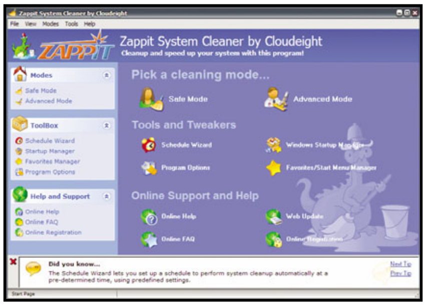


Add New Module
Add a new module to Sandra
Create Report
Create a report of your comp…
Performance Index
Rate the performance of your…
Analysis and Advice
Get advice on how to improve …
Burn-in Computer
Test the stability of your comp…
Environment Monitor
Monitor your computer's envir…
Update Program
Download updates for your co…
For Help, press F1
Local Computer

SiSoftware's SANDRA (System ANalyzer, Diagnostic and Reporting Assistant) has been a benchmarking staple among enthusiasts and analysts for a number of years. But this suite of mini-applications includes a number of other useful tools, as well. With the latest version of the suite, Sandra 2007 SP1, users can not only benchmark and test their system's stability but also get advice on how to increase performance using a couple of built-in wizards. Aside from these capabilities, Sandra 2007 also gives users easy access to system logs, configuration files, and low-level hardware information that's sometimes hard to find. The suite's extensive database of reference systems is also handy for comparing the performance of your rig to similarly equipped systems. The Lite version is a free download; licensing the Pro Home version costs $29.99.

www.sisoftware.net

Cloudeight Zappit System Cleaner



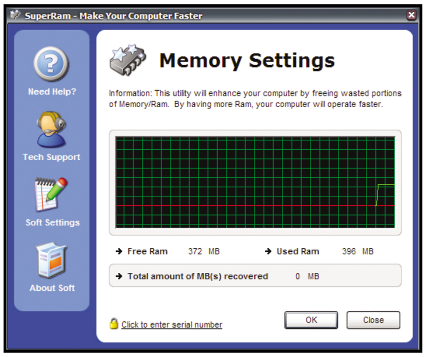
Zappit System Cleaner by Cloudeight
Cleanup and speed up your system with this program!

Did you know...
The Schedule Wizard lets you set up a schedule to perform system cleanup automatically at a pre-determined time, using predefined settings.

Zappit System Cleaner is a useful freeware application that's designed to quickly and safely clean the extraneous bits of data that tend to bog down a Windows-based system over time. Zappit scans the host system's hard drive and Registry and eliminates unnecessary files and keys to free up hard drive space, streamlining the OS. The program offers two modes of operation, a Safe Mode for less-experienced users that eliminates common junk data, and an Advanced Mode for power users that bores deep into the recesses of your drive to do away with such things as AutoComplete form data, Address bar history, and Clipboard data. Zappit also includes a Start-Up Manager and a Favorites & Start Menu Manager.

www.zappit.net

PGWare SuperRAM 5



Information: This utility will enhance your computer by freeing wasted portions of Memory/Ram. By having more Ram, your computer will operate faster.

→ Free Ram 372 MB
→ Used Ram 396 MB
→ Total amount of MB(s) recovered 0 MB

If you're the type of user who never likes to shut down or restart your machine, PGWare's SuperRAM 5 may become one of your favorite applications. This tiny program optimizes a system by freeing wasted memory that crashed, closed, or otherwise disabled applications or services didn't properly release. You can run SuperRAM 5 as needed or configure it to continually run in the background and free memory to predetermined values set in the program's control panel. When running, SuperRAM 5 places a visual representation of available memory in the System Tray. Should you get close to running out of memory, a simple right-click will free as much as possible to keep the system running quickly and minimize hard drive thrashing as active data is swapped into and out of system memory from the Windows swap file. You can try

SuperRAM 5 free for 28 days; a single-user license is $12.99.
www.pgware.com

Macecraft RegSupreme Pro 1.4

Neglecting Windows' Registry and letting it grow unchecked is a surefire way to a sluggish, unstable system. To help keep your Registry free of orphaned keys and junk data, use Macecraft Software's RegSupreme. RegSupreme is relatively easy to use and provides solid results regardless of your knowledge of the Registry. The program deep-scans your system's Registry with one of the more advanced scanners currently available and automatically repairs problems with a click. RegSupereme 1.4 includes an automatic backup feature, as well, which backs up everything the program removes or modifies in case of a problem. Try RegSupreme free for 30 days; a license is $16.95.
www.macecraft.com

Option Explicit Software Pocket KillBox

Few things are more annoying than trying to delete a file or folder on a Windows PC, only to have the OS deny your request and display a warning about the file being in use or otherwise protected, especially when said file is known malware. To get around this annoyance and free up hard drive space, use Option Explicit Software's KillBox. KillBox is a miniscule 90KB download, but the freeware program can open up surprising amounts of hard drive space using a number of built-in methods to delete "locked" files. KillBox features a slick menu for quickly shutting down running processes and a search feature for seeking out unnecessary duplicate files.
www.killbox.net

Yahoo! Widget Engine 3.1

The Yahoo! Widget Engine, formerly known as Konfabulator, isn't a performance-related application in and of itself. The myriad plug-ins, or widgets, available for the freeware application, however, make it an extremely useful tool for power users. In addition to basic widgets that check the weather or monitor RSS feeds, widgets are available to track memory usage, available hard drive space, disk read/write performance, battery life, Ethernet usage, and Wi-Fi signals. New Widgets are released almost daily, making this one of the more flexible programs out there.
widgets.yahoo.com

Dr. TCP

Getting the most out of a broadband connection requires more than buying a killer router and making sure your NIC drivers are up to date. There are actually a handful of Registry settings that can drastically affect broadband throughput, and Dr. TCP makes it easy to tweak all of them. Dr. TCP is a freeware shortcut into the Registry that gives users the ability to alter RWIN (Receive Window), MTU (maximum transmission unit), and TTL (Time To Live) settings, among a handful of others.
www.dslreports.com/drtcp

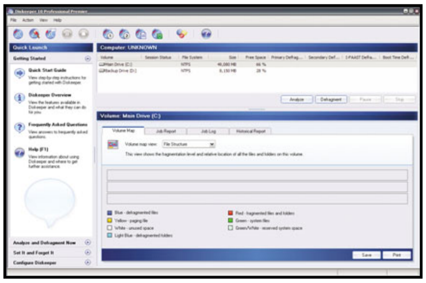
Almico SpeedFan

If you've been overclocking for any appreciable amount of time and care about the noise output of your PC, SpeedFan is a must-have program. SpeedFan is a freeware application that monitors voltages, fan speeds, and temperatures using the hardware monitoring chips incorporated into many of today's motherboards and components. SpeedFan can also access S.M.A.R.T. info where applicable. SpeedFan gives users the ability to alter FSB frequencies on some hardware, as well, for in-Windows overclocking. For the most part, SpeedFan is a hardware monitoring utility, but it can also change fan speeds on the fly according to the temperatures inside your system, depending on the capabilities of the hardware monitoring chip. This in turn reduces the noise emitted from your PC.
www.almico.com/speedfan.php

ATITool

As its name implies, ATITool is a utility for tweaking ATI GPU-based video cards. This freeware application, however, has evolved into much more over time. Of course, you can still use ATITool to overclock ATI video cards, but now the program supports some Nvidia-powered cards, as well. ATITool provides low-level information about many GPUs, and the program can automatically find peak GPU and memory frequencies, which makes it easy for users of all skill levels to tweak their video cards for maximum performance. And by using the built-in artifact tester, users can ensure that their overclocked video cards are not only stable but also producing immaculate images.
www.techpowerup.com/atitool

Diskeeper 10



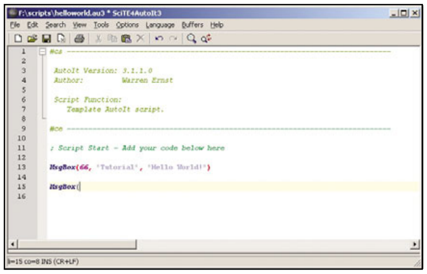
Hard drive performance is one of the major bottlenecks in today's PCs: The drives just can't feed data fast enough to system memory. And matters only get worse if a hard drive is severely fragmented. Windows ships with a basic utility to combat the problem of disk fragmentation, but power users need something more powerful to obtain peak performance. That's where Diskeeper 10 comes in. Diskeeper is a powerful disk defragmenter with a myriad of options for fine-tuning the defragmentation process. Boot-time defrags are available to optimize files that you normally can't move while the OS is active, and you can schedule defrags at predetermined intervals. And for those who don't want to worry about running a manual defrag, Diskeeper's Set It And Forget It feature automates the entire process without any user intervention. Try Diskeeper 10 free for 15 days; the Home version costs $29.95 and the Professional version $49.95.
www.diskeeper.com ▲

by Marco Chiappetta

The Bleeding Edge Of Software

Inside The World Of Betas

AutoIt 3.2.1.1 Beta



F:\scripts\helloworld.au3 * SciTE4AutoIt3
File Edit Search View Tools Options Language Buffers Help

```
#cs ----------------------------------------------------------------------------

 AutoIt Version: 3.1.1.0
 Author:         Warren Ernst

 Script Function:
    Template AutoIt script.

#ce ----------------------------------------------------------------------------

; Script Start - Add your code below here

MsgBox(66, 'Tutorial', 'Hello World!')

MsgBox(
```

li=15 co=8 INS (CR+LF)

Official product name: AutoIt 3

Version # previewed: 3.2.1.1 Beta

Publisher: Jonathan Bennett

Developer and URL: Jonathan Bennett; www.autoitscript.com

ETA: Q4 2006

Why you should care: There's no better scripting tool for Windows.

Windows doesn't come close to possessing the same number of automation tools as any version of Linux, but that's not to say that there aren't any options for Windows users. And in fact, perhaps the best available scripting and automation tool happens to be the lightweight and free AutoIt 3, now in a very robust public beta.

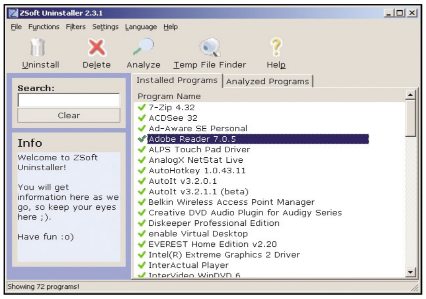
AutoIt was originally created to automate software installations and updates across hundreds of computers for large enterprises, including those packages that don't lend themselves to scripting. As such, AutoIt has the ability to simulate mouse activity, select specific windows and dialog boxes, and output text in ways that genuinely replicate actual user activity. Version 3 is a complete rewrite of the language, allowing for complexity approaching that of more mainstream programming languages but retaining much of the original version's simplicity and leanness.

AutoIt's scripting language resembles VBScript and BASIC, but there's no line numbers or GOTOs. Scripts are simple text files, but the included editor is a mini IDE, providing auto-completion, auto-indenting, code folding, and debugging tools. Scripts can create full dialog boxes, accept input, follow logic, and interact with the Registry, move and resize windows, run executables, and even interact with GUI controls. There's even a compiler to convert scripts into standalone executables, which doesn't require runtime files or a license.

Working with AutoIt is refreshing. Scripts run fast and you can write them quickly, which encourages playing around with things. The language and AutoIt's capabilities are extremely well-documented, complete with lucid examples and vast quantities of well-written plain English. A large user base frequents AutoIt's online forums and manages to help out those who need it. In short, AutoIt may be the perfect tool to automate tasks in Windows, but you can also use it to make small programs (or even prototype larger ones) in a pinch. That such a quality tool is free is amazing. ▲

by Warren Ernst

ZSoft Uninstaller 2.3.1 Beta



Info

Welcome to ZSoft Uninstaller!

You will get information here as we go, so keep your eyes here ;).

Have fun :o)

- ✓ 7-Zip 4.32
- ✓ ACDSee 32
- ✓ Ad-Aware SE Personal
- ✓ Adobe Reader 7.0.5
- ✓ ALPS Touch Pad Driver
- ✓ AnalogX NetStat Live
- ✓ AutoHotkey 1.0.43.11
- ✓ AutoIt v3.2.0.1
- ✓ AutoIt v3.2.1.1 (beta)
- ✓ Belkin Wireless Access Point Manager
- ✓ Creative DVD Audio Plugin for Audigy Series
- ✓ Diskeeper Professional Edition
- ✓ enable Virtual Desktop
- ✓ EVEREST Home Edition v2.20
- ✓ Intel(R) Extreme Graphics 2 Driver
- ✓ InterActual Player
- ✓ InterVideo WinDVD 6

Showing 72 programs!

Official product name: ZSoft Uninstaller

Version # previewed: 2.3.1 Beta

Publisher: ZSoft Software

Developer and URL: ZSoft Software; www.zsoft.dk

ETA: Q4 2006

Why you should care: A quick and easy way to uninstall and monitor installation programs.

If there's one thing Windows can do fairly well on its own, it's uninstall software, so why use a third-party utility for the job? If such a utility weren't free or didn't have a few extra worthwhile features, I'd agree with you, but ZSoft Uninstaller does and is worth the download.

For starters, ZU is fast: It took about three seconds to start up and list all of my uninstallable software. In contrast, getting to the Add Or Remove Software window can take 30 or more seconds to open, which doesn't count the time you spend clicking Start, Settings, and Control Panel. Secondly, you can right-click any entry (select Show/Edit Info) and view details, such as the developer name, version number, used folders, and the actual uninstallation string. Thirdly, you can eliminate all those "dead" entries from your Add Or Remove Software list with a single click. And finally, you can hide items, such as Windows security patches, that you'd never want to uninstall, removing clutter from what is usually a cluttered list.

In this mode, ZU doesn't uninstall a program any differently than Windows. ZU offers a second mode called Analyzed Programs that monitors an installation routine, logs all the changes you make to your system, and then saves the results in a list. You can still uninstall such software in the conventional way and tell ZU to remove everything it saw during analyzation, which is handy for those uninstallation routines that tend to leave things behind.

ZU is not without flaws, however. It froze a few times, and the Help file is fairly incomplete. Still, ZU is a good choice at an agreeable price. ▲

by Warren Ernst

UP TO SPEED

Upgrades That'll Keep You Humming Along

Media players attracted a lot of support and development this month as Windows Media Player 11, Google Video Player, and DivX all get refreshed. Google's new IE Toolbar will have the rest of us waiting for the features to show up on the Firefox version.

Upgrades

AnyDVD 6.0.5.1

The DVD decrypter gets a new version of Puppetlock protection and updates SetDisplayFrequency.exe. There are several minor fixes including adjusting the USB sticks visibility in AnyDVD's status window.

Get it at: www.slysoft.com

DivX Player 6.3

The newest version of the video player now lets you publish clips directly to Stage6 and has HD playback enhancement.

Get it at: www.divx.com

EssentialPIM Pro 1.9 Beta 2

The task manager and note keeper gets a host of additions: It empties trash and clears database load history on exit and has a shortcut for viewing private data, new priority icons, and a new "private" label in the right-click menu.

Get it at: www.essentialpim.com

Google IE Toolbar 4

The new search toolbar adds Bookmarks, which stores favorites online for access from any PC that has the toolbar installed. A Send To feature now shares URLs via email, blog, or SMS.

Get it at: www.google.com

Google Video Player

This version of Google Video includes thumbnail navigation, letting you jump to scenes within the clip. The player generates thumbnails progressively as more of the film is buffered. You can also find phrases in a clip with a search box.

Get it at: www.google.com

Griffith 0.6.2

This movie collection manager works much like music libraries. You put in some tag information about the film and the program reaches out to Web sources to complete the description. This version fixes minor bugs and has extra artwork.

Get it at: www.griffith.vasconunes.net

Nero CD-DVD Speed 4.60

With this update Nero's optical drive benchmark gets better support for HD-DVD/BD-RE/BD-RE DL drives. There's also improved support for Asus drives and new interface icons.

Get it at: www.cdspeed2000.com

Nvidia nTune 5.00.11.06

The overclocking and tweaking utility for nForce motherboards replaces all previous versions with a completely updated program. It lets you over- and underclock the system components, temperatures, and voltages.

Get it at: www.nvidia.com

Paint.NET 2.72

This open-source image editor gets a new Zoom Blur visual effect. Fixes in this update correct faulty DPI saving and loading, a tweak for the way Text Tool works with special characters, and some color issues when loading PNG files.

Get it at: www.getpaint.net

The Bat 3.815.03

This email client gets improved features and numerous fixes, including keeping the log file in Unicode format, fixes for address book issues and filtering messages to a non-existing drive, among others.

Get it at: www.ritlabs.com

Windows Media Player 11 Beta 2

This update addresses bugs reported in the first release. More online stores are available, and Microsoft has changed the ways you can share music.

Get it at: www.microsoft.com

Writely Beta

Google recently relaunched Writely with numerous enhancements: collaboration tools, including RSS notification of edits; much richer editing features; and on-the-fly viewing of documents as HTML.

Get it at: www.writely.com

ZENcast Organizer 1.02.11

This update makes QuickTime transfers faster, adds a scheduler for updating media channels, and enables concurrent downloads. There's also a cleanup tool for removing old ZENcasts from your PC.

Get it at: www.creative.com

Driver Bay

ATI Catalyst 6.8

Mainly improvements for games in this driver set for Radeon cards. Lord Of The Rings: TBFME; Prince Of Persia: The Two Thrones; and Splinter Cell: Chaos Theory get fixes. There are also bug fixes in DVD playback in Windows Media Player.

Get it at: www.ati.com

Gracenote Update For Creative Applications

This security fix applies to Creative MediaSource and other player and toolbar software that pull music track information from the Gracenote service (formerly CDDB). It fixes a security vulnerability.

Get it at: www.creative.com

Nvidia ForceWare Quad SLI 91.45

This driver resolves numerous SLI technology issues and adds several enhancements.

Get it at: www.nvidia.com

by Steve Smith

Stealth Surfing

Internet Anonymity Products Roundup

If you're uncomfortable about browsing the Internet and leaving behind tracks that a hacker or even just unwanted prying eyes could find, don't feel alone. There are many people who would prefer having the option to browse without worrying about what trails they might be leaving behind.

There's a whole category of software that can help address these issues: anonymizers. They're written with security-conscious users in mind, people who don't necessarily have anything to hide, but don't want their browsing or Internet activities exposed to others. Anonymizers let you surf as if you were someone else—or more precisely, as if you're no one in particular—and prevent hackers from tracing your browsing habits.

For this review I originally rounded up a collection of seven or eight programs and was quite startled by what I found. Many of them were well-written and had proxying services provided by their manufacturers, but some of them were little more than front ends for questionable lists of third-party "open relay"-type proxies around the Internet. (See the "Get Anonymity, Not Unaccountability" sidebar for more information.)

For an additional perspective, I also tested each anonymizer's proxy information using the wealth of tools available from DSLReports.com.

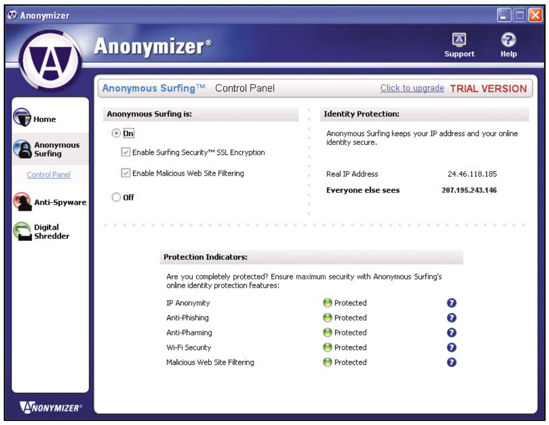
Anonymizer Anonymous Surfing 6.0

Anonymous Surfing is a deliberately simple application, designed only to anonymize Web surfing and nothing else. For the most part, Anonymizer uses a "set it and forget it" approach: You install the program, turn it on, and use your computer normally.

You can manage the program through an icon in your Taskbar: Click it to bring up Anonymous Surfing's Control Panel. In this window you can turn Anonymous Surfing on or off. For added security, you can turn on the Surfing Security SSL Encryption feature, which encrypts all traffic to and from Anonymizer using 128-bit SSL. Another optional feature, listed as Malicious Web Site Filtering, filters out potentially hazardous Web sites. This dangerous-site filter is a bit of a black box: There's apparently no way to configure it because it relies on Anonymizer's automated robot crawlers to determine what's dangerous. It's good that Anonymous Surfing provides this feature, but I left it off when I did most of my surfing.

One significant difference I noticed between anonymized and regular traffic was a trade-off in line speed, even if the differences were mostly observational. Opening the graphics-heavy Amazon.com home page took noticeably longer through the proxy, for instance. DSLReports.com reported my anonymized address as being part of ISP GBU Internet LLC. Anonymous Surfing reports your real and anonymized IP address in its Control Panel for easy reference.

The software's manual includes instructions on how to configure Anonymous Surfing with several desktop firewall products such as ZoneAlarm or McAfee Internet Security Suite. If you're using a hardware firewall, though, the program doesn't list details on how to configure it.



Anonymous Surfing is:

● On

☑ Enable Surfing Security™ SSL Encryption

☑ Enable Malicious Web Site Filtering

○ Off

Identity Protection:

Anonymous Surfing keeps your IP address and your online identity secure.

Real IP Address 24.46.118.185

Everyone else sees 207.195.243.146

Protection Indicators:

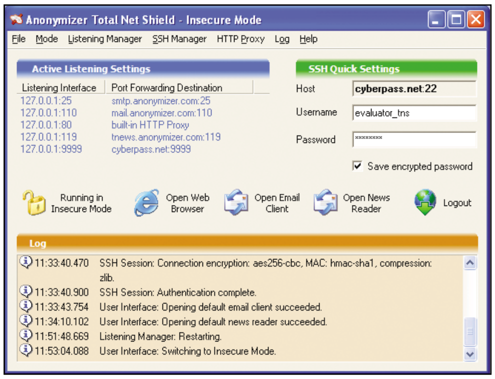
Are you completely protected? Ensure maximum security with Anonymous Surfing's online identity protection features:

IP Anonymity	Protected
Anti-Phishing	Protected
Anti-Pharming	Protected
Wi-Fi Security	Protected
Malicious Web Site Filtering	Protected

The lack of configurable options makes using Anonymizer a "set it and forget it" experience, for better or worse.

Anonymous Surfing 6.0
$29.99 (one-year subscription)
Anonymizer
www.anonymizer.com
● ● ◐

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ● ● ◐ 2.5 = ABSOLUTELY AVERAGE | ● ● ● ● ● 5 = ABSOLUTELY PERFECT


Anonymizer Total Net Shield - Insecure Mode
File Mode Listening Manager SSH Manager HTTP Proxy Log Help
Active Listening Settings
SSH Quick Settings
Running in Insecure Mode
Open Web Browser
Open Email Client
Open News Reader
Logout
Log

Listening Interface	Port Forwarding Destination
127.0.0.1:25	smtp.anonymizer.com:25
127.0.0.1:110	mail.anonymizer.com:110
127.0.0.1:80	built-in HTTP Proxy
127.0.0.1:119	tnews.anonymizer.com:119
127.0.0.1:9999	cyberpass.net:9999

Host: cyberpass.net:22
Username: evaluator_tns
Password: ********
☑ Save encrypted password

```
11:33:40.470   SSH Session: Connection encryption: aes256-cbc, MAC: hmac-sha1, compression:
               zlib.
11:33:40.900   SSH Session: Authentication complete.
11:33:43.754   User Interface: Opening default email client succeeded.
11:34:10.102   User Interface: Opening default news reader succeeded.
11:51:48.669   Listening Manager: Restarting.
11:53:04.088   User Interface: Switching to Insecure Mode.
```

Total Net Shield is a more sophisticated (and expensive) program than its little brother, Anonymous Surfing, but it covers just about everything you could need.

Total Net Shield
$99.95 (one-year subscription)
Anonymizer
www.anonymizer.com
●●●●

Most of the outbound services from the application appear to be across HTTPS, which makes it relatively easy to work with.

Anonymous Surfing's biggest limitation, again, is that it only anonymizes Web traffic and nothing else. If you want a broader range of anonymized services, the company also offers a more advanced software called Total Net Shield (see the review below). For additional protection, you can purchase Anti-Spyware and/or a Digital Shredder Lite tool (for erasing locally stored information such as browser histories) directly from the company. But, like the additional applications GhostSurf includes (see the "Tenebril GhostSurf 2005/GhostSurf Platinum 2006" review), there's not much in the bonuses you can't get for free elsewhere.

Anonymizer Total Net Shield

Anonymizer Total Net Shield is the bigger brother to Anonymous Surfing. It not only anonymizes Web browsing, but also IRC, email, and Usenet news, as well. The software does all of this through a VPN connection that the company runs, so it's an approach that's somewhat similar to the Steganos software (see the "Steganos Internet Anonym VPN 1.0.5" review). However, there are no bandwidth limits; although you can only buy a year's worth of service at a time, meaning you can't buy in one-month increments as you can with Steganos.

Get Anonymity, Not Unaccountability

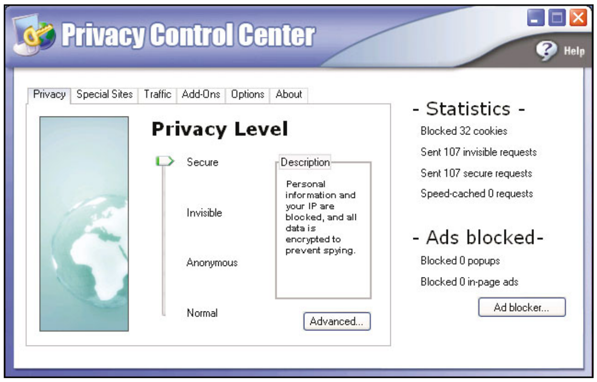
A number of the programs I rounded up for this review were advertised as anonymity applications that use proxies to disguise your connection. Rather than using networks the manufacturers supply, however, they were simply plugging into connections from a scavenged list of publicly accessible proxies.

The identity and security of those proxies was questionable enough, but what was even more disturbing was how these programs didn't even mention the possibility that using these proxies in this manner might not even be legal. I wasn't reassured by the manufacturers listing their programs as "public proxies" because a number of the addresses (such as open mail relays) seemed to be far from suitable for public use. Laws about what constitutes illegal Internet usage vary widely among countries, which only makes the issue all the stickier.

Anonymity 4 Proxy is a good example of these questionable proxies. It's not a portal for a service; it's just a front end through which you can access proxy servers you register with the program. When I installed the demo version, it came with a list of proxies that all turned out to be useless. This didn't surprise me much because they were all last verified on July 6, 2004. Worse, many of them seemed to be mail servers—open relays—which means that surfing through them could be illegal. And nowhere on Anonymity 4 Proxy's Web site is there any mention that the accessing proxies it lists could be illegal or dangerous.

AnonySurf has the same problem as Anonymity 4 Proxy. It's a front end for a number of third-party proxy servers on the Internet, but these proxies have no testable pedigree. Likewise, nowhere on the program's Web site is there anything about the possibility that using a third-party proxy is potentially illegal. ViewSpace Technologies' ViewShield, another proxy router product, has its proxying as a relatively minor feature (it's mostly for blocking cookies, pop-ups, and the like). But again, nowhere in ViewShield's documentation does it mention that using proxies may be questionable.

What's the difference between programs like these and the ones I reviewed in the main article? Accountability. With the companies not listed in this sidebar, there's a name and a "terms of service" you can associate with their applications and services. With the programs in this sidebar, however, unless you supply a proxy you actually know and trust, it's entirely at your own risk. For users who are genuinely conscientious of their privacy, this is unacceptable. In short: Don't use an anonymity program that doesn't work on its own dedicated network or that doesn't have a list of contractual terms of service. ▲



Personal information and your IP are blocked, and all data is encrypted to prevent spying.

- Statistics -

Blocked 32 cookies
Sent 107 invisible requests
Sent 107 secure requests
Speed-cached 0 requests

- Ads blocked-

Blocked 0 popups
Blocked 0 in-page ads

GhostSurf affords the user some flexibility in how it configures services—what to block and how much to anonymize.

GhostSurf 2005/GhostSurf Platinum 2006
$29.95/$49.95 (one-year updates)
Tenebril
www.tenebril.com
● ● ●

When you register for Total Net Shield, you'll create a username and password to log into the VPN. This is also your email address through the anonymization service—the address is *username*@mail.anonymizer.com—so you can send and receive email anonymously, as well. (Steganos doesn't currently allow sending anonymous mail, more in just a moment.) The program also automatically configures a number of popular email, Web browser, newsreader, and IRC clients for you.

Once I installed and set up Total Net Shield, using the program was pretty seamless. As with many of the other proxies, browsing is incrementally slower than when not using the proxy, mostly when surfing a site that opens several connections at once. A Whois trace on the IP address Total Net Shield assigned me showed it was coming from a block in Verio.net (NTT America).

Using other applications through the proxy wasn't too hard, although it requires some savvy about how to do it because the instructions don't have any generic directions. You can always run the application configuration wizard separately from the program itself, as well, although doing so won't help with applications Total Net Shield doesn't explicitly list there. AOL Instant Messenger isn't on the list of programs that TNS configures automatically, but with a little work I was able to get AIM running by redirecting it through the HTTP proxy.

Surf In The Dark: Darknets For Anonymity

Instead of paying for anonymity applications, some users have started to roll their own free and open-source anonymity systems from the ground up. Imagine a system where you could download a client and connect to a "cloud" of other users, all operating peer-to-peer, and retrieve any piece of information from the Internet through this cloud. Along the way, users could encrypt and randomize all transfers, making it nigh impossible to trace any particular download to any particular user. Such clouds are often called darknets because they exist on the Internet itself but are invisible ("dark") to anyone not using them.

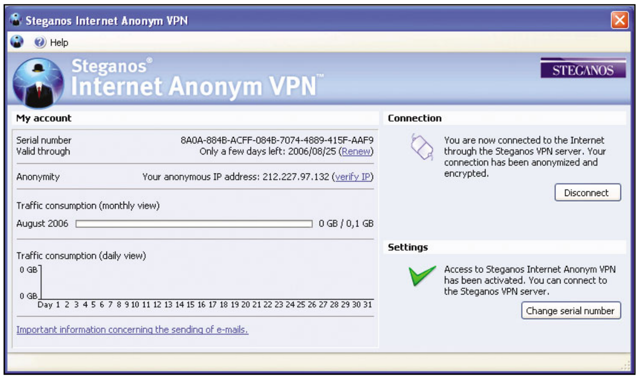
One implementation of such a system already exists: Tor (TheOnionRouter; tor.eff.org), which works almost exactly in the manner I described above. Anyone who uses Tor can either run as a client or donate some of his own bandwidth to let other users browse anonymously. The more people who use Tor, the more powerful and heavily anonymized the system becomes. Right now the whole system is still technically a beta-test, under-development project, but anyone curious about how it works can use it. ▲

The Control Panel for the program is much more sophisticated and malleable than Anonymous Surfing's Control Panel. The main window lists the SSH ports that the program listens on for its local proxy (Web, news, mail, etc.), the login settings, any current authentication activity to the proxy, and a set of buttons for launching preconfigured applications. The advanced settings for the program let you choose from many available encryptions; the most common is 256-bit AES. You can restrict using less-robust algorithms if you're worried about them being compromised. You can also switch off the proxy with one button if you want to go back to normal surfing on the fly.

Total Net Shield doesn't have any of the local data-scrubbing tools some of the other programs listed here have (although it's fairly easy to get those for free), and its cost may be prohibitive. But if you're willing to swallow that, this program comes very close to living up to the "total" in its name.

Tenebril GhostSurf 2005/GhostSurf Platinum 2006

The standard version of GhostSurf 2005 anonymizes both regular Web traffic and a number of other services via a set of add-ons: IRC, Usenet news, instant messaging,


Steganos Internet Anonym VPN
Help
Steganos®
Internet Anonym VPN™
STEGANOS
My account
Connection
Disconnect
Settings
Change serial number
0 GB
0 GB
Day 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Serial number 8A0A-884B-ACFF-084B-7074-4889-415F-AAF9
Valid through Only a few days left: 2006/08/25 (Renew)
Anonymity Your anonymous IP address: 212.227.97.132 (verify IP)
Traffic consumption (monthly view)
August 2006 0 GB / 0,1 GB
Traffic consumption (daily view)
Important information concerning the sending of e-mails.

You are now connected to the Internet through the Steganos VPN server. Your connection has been anonymized and encrypted.

Access to Steganos Internet Anonym VPN has been activated. You can connect to the Steganos VPN server.

Steganos Internet Anonym VPN's interface shows you how much bandwidth of your total allotment you're using per month.

Internet Anonym VPN 1.0.5
$14.95 (one month)/$99.95 (one year)
Steganos
www.steganos.com
● ● ● ◖

and variable levels of encryption (up to 1,024 bits) are all available for free. GhostSurf's designed to be an application that you can set up and forget about, so when you first install it, it configures Internet Explorer to use the local proxy it sets up. Also, you can easily set any other programs that use proxies, such as Firefox, to use the local proxy (port 7212).

For a given connection, GhostSurf institutes three levels of protection: It blocks cookies, routes data through GhostSurf's anonymous servers, and encrypts data in transit. The default encryption strength is 56 bits, but if you are a U.S. resident, you can upgrade to 256-bit encryption for free. One of the best features of this program is that according to the product's technical support people, there's no inherent bandwidth limit: You can surf and download as freely as you like. GhostSurf also has a certain amount of flexibility when it comes to how it sanitizes data. For instance, if you want to log into a site that requires cookies, you can continue to accept cookies and still encrypt your connection.

Most of the time you won't need to deal with the program's interface, but you can summon it from the System Tray whenever you need to make changes. From there you can change the program's privacy level on the fly, add or remove instructions on how to sanitize data to or from specific domains, see a log of all traffic, set up add-on components, and control which HTTP headers it sanitizes. A reverse query on the proxy I was using came back as ServerBeach.com, based in Texas.

Browsing is painless, but unfortunately the instructions for how to use the instant messaging component are somewhat confusing and contradictory. When I looked up details for the IM component, the information said I didn't need to configure anything. Elsewhere in the help file, however, I read that users need to modify certain Web site entries that come preconfigured with the program to anonymize IM traffic. Worse, I couldn't tell from the program's monitoring screen if it was protecting IM traffic. The NNTP/Usenet anonymizer will only work if your ISP allows connections to its news servers from outside (mine didn't), or if you use a third-party news provider.

GhostSurf Platinum 2006 comes bundled with four tools: AdArmor (blocks advertising), SpyCatcher (a spyware-detecting application), and Personal Data Vault and TracksCleaner (two data-sanitizing and -erasing tools). These tools aren't bad, and they fit in with the program's overall mission to protect your privacy. If you just want to pick up the basic edition of GhostSurf, though, other implementations of these tools are often available elsewhere for free.

Steganos Internet Anonym VPN 1.0.5

Steganos Internet Anonym works by redirecting *all* of your system traffic through a VPN connection to its own anonymizing servers. As a result, all of your network services are completely anonymized by default, and you're given a totally new IP address that you can verify at any time.

When you set up the program, it installs a software VPN adapter into the Windows networking stack. A warning window will pop up because the adapter isn't a Microsoft-certified driver, but the program briefs you about this beforehand so the installation goes fairly smoothly. If you're running a software firewall, you'll need to adjust it to grant access to Internet Anonym. (The program includes instructions on how to do this for a couple of common software firewalls.) On the other hand, if you're using a hardware router or network sharing device, Internet Anonym doesn't list details in its help file about how to deal with these devices. For the sake of simplicity, I just put the test computer into my hardware firewall's DMZ and proceeded from there.

The Steganos VPN uses 128-bit SSL encryption for all of its traffic, which is more than enough to keep casual surveillance out. Browsing the 'Net through the VPN seemed only marginally slower to me than usual. Like a lot of other proxying products, it seemed to be slower at establishing several connections at a time, although the speed over each individual connection is satisfactory. The program's

Application/Features	Anonymizer Anonymous Surfing	Anonymizer Total Net Shield	Tenebril GhostSurf 2005	Steganos Internet Anonym VPN
Max encryption level	128-bit	256-bit several encryptions available	56-bit with 256-bit upgrade for U.S. residents	128-bit
Supports all protocols	HTTP only	Yes, provided they can be redirected through the proxy	HTTP, plus other services with add-ons	Yes
Protection against spyware	Yes, with Anonymizer Anti-Spyware app	No	No	No
Automatic file deletion/cleanup	Yes, with Digital Shredder Lite app	No	Yes, with Platinum edition	No
Compatible with firewall apps	Yes	Yes	Yes	Yes
Known malicious site warnings	Yes	No	No	No
Monthly bandwidth	No limit	No limit	No limit	25GB
Selective anonymization of sites or data	No	No	Yes	No
Email services	No	Yes	No	No
Price	$29.99 (one year)	$99.99 (one year)	$29.95 (one year)	$14.95 (one month); $99.95 (one year)

main interface shows your public IP address and a handy bandwidth meter to let you know if you're getting close to your monthly 25GB allowance. The new IP address I was assigned apparently originated from a block assigned to Schlund .de in Germany

One of the things you can't do through the Steganos VPN is send email via SMTP. When you first install the product, you'll get a warning about how Steganos has disabled the ability to send SMTP email because some users have been using this feature to send spam. The company is working on a way for legitimate email users to work through the VPN, though. But if you use Web mail services such as Gmail or Hotmail, these restrictions won't apply. (And you can always shut off Steganos' VPN to access SMTP email.) Another problem is that any local services, such as Usenet news that you can only access from within your ISP's address block, won't work through the VPN.

Because Steganos was written and developed overseas, there are some small irregularities I noticed in the interface—not fatal, just quirky. For one, the registration page came up in German (although you can easily change that), and some of the program's prompts used a comma instead of a decimal point.

The default version of the program allows 25GB of transfers for one month (about a gig per day) for $14.95. A more advanced version offers 12 months of 25GB per month for $100, and for $259 you can get 85GB per month for a whole year. The trial version of Internet Anonym lets you test it for a few days under the 25GB limit, which is an excellent way to get a feel for the program before you buy. ▲

by Serdar Yegulalp

A Zone For Free Speech

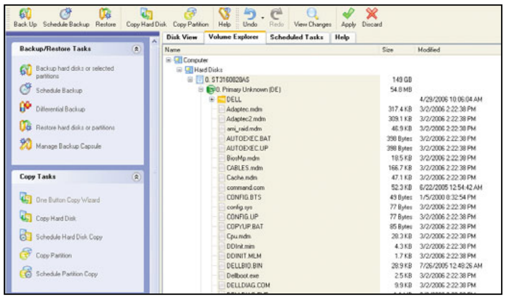
A step beyond Tor is another project called Freenet (freenetproject.org). Freenet isn't designed for browsing the Web itself, however: It's a "free speech zone" into which anyone can publish and retrieve anything anonymously. Each user that runs Freenet acts as both a client and a server, hosting a tiny piece of the total share of data he inserts into Freenet on his computer. If you want to retrieve a given piece of data, you need to know its corresponding encryption key—provided you know the encryption key for a given piece of data.

A user can't manually delete anything he publishes into Freenet, either, because everything put into it is encrypted and anonymized. This also means that it doesn't really matter who's running what node because he has no way of knowing what's stored in his own node. Countries with heavy Internet censorship policies, such as China, have successfully used Freenet to share information about everything from government perfidy to locally censored news. Right now the program is undergoing a major rewrite to improve its speed and routing efficiency, but the curious and stalwart can try one of the new stable alpha builds. ▲

Paragon Software Group Drive Backup 8.0 Personal

Paragon Software has earned a reputation with *CPU* reviewers over the years as being a dependable source for hard drive-related apps. That's based on such software as Partition Manager, Disk Wiper, and now Drive Backup.

Highly touted in this version is an improved, Windows Explorer-like GUI. It's still isn't exactly inviting to novices, but it's fine for power users. Visuals are few, but textual details advanced users love are in fair supply, including file system data, partition IDs, root entries, sectors per boot and cluster, and more. The app's window includes panes for Backup/Restore Tasks, Copy Tasks, Tools, and News/Documentation containing tools for scheduling backups; creating recovery discs and differential backups; copying and restoring drives and partitions; and checking drive, partition, and disc integrity. A slick One Button Copy Wizard does drive-to-drive copying, and there's also a handy image explorer.



Four buttons and a variation of a File menu along the top include such tools as a real-time imager, which lets you keep working while it does and without a reboot needed afterward. A great Wizards button has 14 shortcuts, and the main work area has four tabs for Disk View, Volume Explorer, Scheduled Tasks, and Help. The Help options include screenshots, which is nice for newcomers stumbling along.

I tested on an Intel-based Dell Dimension 5150 with a 150GB OEM drive and on an AMD Athlon 64 3700+-based Gigabyte GA-K8VNXP Via K8T800 rig with an 80GB Western Digital drive. Images I created of both drives at fast compression settings resulted in a 22GB image for the Dell rig (about 20 minutes) and an 8.7GB image of the Gigabyte (about eight minutes). Scheduling, copying, and differential backup tools worked without problem, but creating recovery discs with OS auxiliary files and password protection took four attempts on the Dell rig, though I'm still unsure why the fourth attempt worked.

The app comes in Small Business Server, Server, Enterprise, and Pro editions. ▲

by Blaine Flamig

Drive Backup 8.0
$49.95
Paragon Software Group
www.drive-backup.com
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Easy Data Access Docsvault Professional

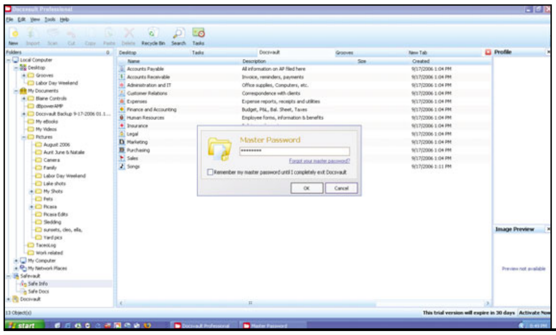
Look at your desk. Is it cluttered with a paper trail of bank records, bills, photos, and more? Do you have Zip disks and CDs and DVDs scattered about that you're afraid to get rid of but don't know how to organize? Many of us can answer yes to both questions. Well, if you want to clean up the mess, plus much more, Docsvault deserves serious consideration. It's best-suited for small office/small business settings, but it's ideal for everyday, all-day users who incessantly deal with mountains of documents.

Described as a "paperless office solution," Docsvault eliminates the reliance on paper with such tools as an integrated PDF creator and scanning abilities. Once you integrate your data into the program, you can view it several ways. Docsvault can store the most important of that data with 128-bit encryption in a Safevault, which is password-protected and well-organized into Safe Info subcategories.

Docsvault's data-management tools don't require a steep learning curve to use or spending a fortune to acquire. In fact, most actions are drag-and-drop easy, and the app's price may be its best selling point. A pro-level document manager with this much functionality at under $50 is a bargain. Finding one that performs as Docsvault does is just as pleasing.

The program relies heavily on Windows Explorer for its interface, and it's a good choice for these tasks. Additionally, tabs conveniently let you view different areas of a drive simultaneously, and there's also a fair Backup/Restore tool and ability to archive data to CD/DVD and other removable media. The search and indexing functions are straightforward, as are most functions. Those that weren't for me were cleared up by the help tools, which cover a broad spectrum of topics in good detail. Importing data from a scanner was a snap, and creating new folders and files in existing cabinets to arrange my data in a makes-sense-for-me manner was also easy.

Considering its more-than-friendly price, Docsvault is an enticing package for those looking for a program that can manage, back up, archive, and scan in data, plus manage your tasks. Home and SMB versions are also available. ▲



by Blaine Flamig

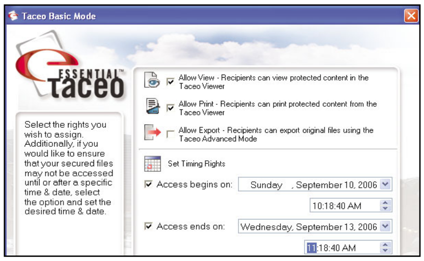
Docsvault Professional
$49.99
Easy Data Access
www.docsvault.com
●●●●

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ●●◐ **2.5 = ABSOLUTELY AVERAGE** | ●●●●● **5 = ABSOLUTELY PERFECT**

Essential Security Software Essential Taceo 1.6.5

Say you think Jane in accounting is cute and tell Larry as much in an email. Larry shoots his fat email mouth off, forwarding the message around the office. The embarrassment will pass, but what if that message actually contained code you developed and Larry's misguided forwarding landed it in your competitor's inbox? Essential Taceo aims to prevent such scenarios from occurring.

Taceo is "email antitheft software" that puts email security "in a confidential envelope." Basically, this means it lets you set access rights to email and attachments (30-plus file types supported; not MP3s or AVIs) you send. You decide if a recipient can forward, copy, paste, perform screen captures, or print messages/attachments. You can also set how long those rights last and encrypt messages. To this end Taceo is an inexpensive, intuitive choice for small businesses and individual users who handle sensitive data. An Advanced mode lets you further tweak settings, including configuring proxy and Exchange servers, adding signatures and user groups, and more.



Select the rights you wish to assign. Additionally, if you would like to ensure that your secured files may not be accessed until or after a specific time & date, select the option and set the desired time & date.

☑ Allow View - Recipients can view protected content in the Taceo Viewer

☑ Allow Print - Recipients can print protected content from the Taceo Viewer

☐ Allow Export - Recipients can export original files using the Taceo Advanced Mode

Set Timing Rights

☑ Access begins on: Sunday , September 10, 2006 10:18:40 AM

☑ Access ends on: Wednesday, September 13, 2006 11:18:40 AM

Using Taceo requires downloading it from ESS' site, registering it, and using an activation link to verify a password you set. You need .NET 1.1 Framework installed; Taceo can do this if it's not. To view messages recipients need to get a free ECC Viewer using the same download, install, and activation routine.

Using Taceo means opening a dialog box into which you drag files and folders to secure. These are saved with an .ECC extension, forming the "envelopes" only designated recipients can open. You then open a new message, attach the files, and send. Taceo also integrates buttons into Outlook that perform the same tasks. Taceo only integrates into Outlook, though, and there's no Mac or wireless device support yet (but it's in the works). A notebook feature lets you remotely deny access to Taceo if your notebook is stolen.

I used Taceo without problem on three rigs using Outlook, Outlook Express, Gmail, Yahoo! Mail, and MSN accounts and corporate firewall/AV apps, Trend Micro PC-cillin Internet Security, and ZoneAlarm and AVG's free versions. ▲

by Blaine Flamig

Essential Taceo
$59 per year; single user
Essential Security Software
www.essentialsecurity.com
● ● ● ●

ActualTools Actual Window Manager 4.1

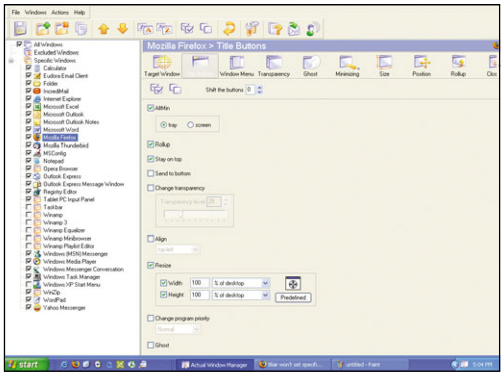
Actual Window Manager isn't imperative to own. In fact, you'll carry on just fine never having used it. Still, download and pop it open and you'll find yourself immersed in all it offers, which essentially is tools for managing, manipulating, and automating how your windows function.

Other apps do a lot of what AWM does, but arguably not to the same extent. As AWM's thorough Help guide explains, you can apply rules universally to windows, to specific ones, and exclude others entirely. Once installed, buttons that appear next to a window's standard Maximize, Minimize, and Close buttons let you resize and roll up windows. This last space-saving option coolly leaves only a window's title bar behind until you unroll the window again. Other buttons turn a window transparent, force it to align to a precise location, and keep it on top of others.

AWM's real draw is how much you can tweak these actions. For example, I set Outlook to roll up when inactive but also set a delay before it did so. I also set Firefox's window to turn transparent at a certain transparency level, prevented Firefox from closing accidentally, adjusted pixel by pixel the position for it to open on the Desktop at startup, Ghosted it so I could view it but pass the mouse cursor through it to click a background window, forced it to minimize to the System Tray rather than Taskbar, and more. There are more than 40 of these tweaks. Applying them to windows won't make you dramatically more productive, but it does eliminate many annoyances associated with working with multiple windows at once.

New to this version is multiple-monitor support, which, for example, lets you open a window automatically on the second monitor in a precise location rather than dragging it there. You can also configure the window's size to match the resolution of the monitor you're sending it to.

AWM is a tiny 3.36MB download, and it has a free, 60-day trial. Use the trial first to decide if you're the type of multitasking user whom AWM will benefit before paying the somewhat-steep $39.95 price. ▲



☑ All Windows
Excluded Windows
Specific Windows
☑ Calculator
☑ Eudora Email Client
☑ Folder
☑ IncrediMail
☑ Internet Explorer
☑ Microsoft Excel
☑ Microsoft Outlook
☑ Microsoft Outlook Notes
☑ Microsoft Word
☑ Mozilla Firefox
☑ Mozilla Thunderbird
☑ MSConfig
☑ Notepad
☑ Opera Browser
☑ Outlook Express
☑ Outlook Express Message Window
☑ Registry Editor
☑ Tablet PC Input Panel
☐ Taskbar
☐ Winamp
☐ Winamp 3
☐ Winamp Equalizer
☐ Winamp Minibrowser
☐ Winamp Playlist Editor
☑ Windows (MSN) Messenger
☑ Windows Media Player
☑ Windows Messenger Conversation
☑ Windows Task Manager
☐ Windows XP Start Menu
☑ WinZip
☑ WordPad
☑ Yahoo Messenger

Mozilla Firefox > Title Buttons

Shift the buttons 0

☑ AltMin
◉ tray ○ screen

☑ Rollup

☑ Stay on top

☐ Send to bottom

☐ Change transparency

☐ Align

☑ Resize
☑ Width 100 % of desktop
☑ Height 100 % of desktop
Predefined

☐ Change program priority

☐ Ghost

by Blaine Flamig

Actual Window Manager 4.0
$39.95
ActualTools
www.actualtools.com
● ● ●

CPU RANKING ○ **0 = ABSOLUTELY WORTHLESS** | ● ● ◖ **2.5 = ABSOLUTELY AVERAGE** | ● ● ● ● ● **5 = ABSOLUTELY PERFECT**

Dialogue Box

Vista Will Double Apple's Market Share

by Chris Pirillo

For one reason or another, Microsoft abandoned development of Internet Explorer a few years back, falling victim to the assumption that the world didn't need anything more from a Web browser. This turned out to not be the case. The Firefox Project provided enough of an alternative to convince users and influencers to switch—with a true cross-platform allure too enticing to ignore. Microsoft executives ultimately decided to begin development on IE7, but its release will likely drive even more people to Firefox. Why? Because it's too little, too late.

I loved Internet Explorer—loved it. Microsoft even sent me a T-shirt for participating in Midnight Madness with the final release of an earlier IE build some years ago when the world was largely stuck on dial-up. I loved using MSN Search. There were few decent alternatives even when Microsoft started serving pop-up advertisements with my search results. Eventually, I grew tired of these annoyances and turned my attention to Google, which, at the time, looked like an inferior product. But, Google made "search" work better than ever before. Windows Live attempts to reinvigorate Microsoft's online brand, but few people have bothered to pay attention. Why? Because it's too little, too late.

The industry hasn't seen a new desktop OS come from Redmond since Windows XP. We've all been waiting with bated breath for Vista to revolutionize the way we . . . what the hell is this?! RC1 feels and looks more like an early beta than it does a final product, and they want me to fork over how much for it?

Off the shelf, Windows Vista Ultimate will cost the user $399 per copy, with subsequent licenses weighing in at $359 each. Upgrade prices for Ultimate are slightly less exorbitant ($259 for the initial upgrade and $233 for additional copies). If you're planning on upgrading your home network of five machines, you're going to spend $1,191 for five Ultimate upgrades. Conservatively, if you're upgrading the same network to Home Basic, you're going to spend $460. This time? It's too much, too late.

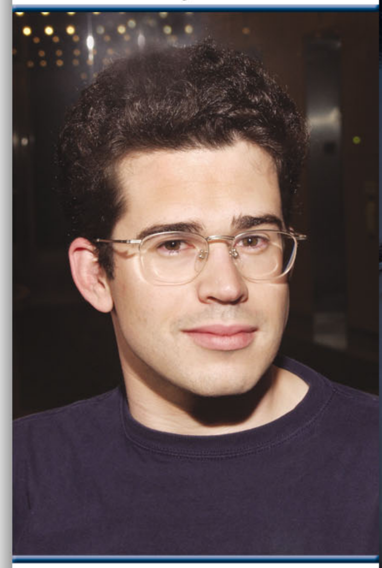
My mom loads her start page and types "Google" into the search box. My fiancée pulls up iTunes to download the latest Bob Dylan album. My dad asks how he can download Firefox because friends told him it was safer to use, but only after asking how to install the latest spyware definitions, copy photos from his camera, back up all his important files, delete the programs he doesn't want on his desktop, etc.

I'm a nanometer away from switching my family over to OS X when Apple releases Leopard in Q1 of 2007. It looks clean and elegant. It comes with all the software and services the average user could ever want. It runs on the same hardware. A system will be able to dual-boot between OS X and Windows, and pricing is no longer astronomical. But most importantly? With its UI inconsistencies, Vista feels completely schizophrenic, and that's enough of a reason for anybody to leave Windows in the dust—just like they left MSN Search and IE.

Yesterday's arguments don't really hold water in today's marketplace, and as a serious technologist, you need to recognize that. Forget the whole "Windows has more software" debate because that's absolute bunk. More and more, we're moving our lives online, spending our day in an email client and/or a Web browser (if, indeed, they're not one in the same). We demand easier, better solutions than those that we currently have.

Remember how you felt when you saw "The Phantom Menace" for the first time? I was overwhelmingly disappointed. That's exactly how Windows Vista RC1 makes me feel, and that's not very likely to change between now and when the OS goes gold. Before now, there wasn't a viable "Google" or "Firefox" for the Windows platform. Between Apple's Boot Camp and Parallels (www.parallels.com), you're going to have to make a strong argument to keep people from finally making the switch. And you wanna know the worst part of this entire situation?

Microsoft, in each and every instance, has been its own worst enemy. ▲



Chris Pirillo has been a Windows fanatic for over a decade. Lockergnome.com sprang to life in 1996 with the intent of connecting other passionate PC users with helpful information. His personal blog, at Chris.Pirillo.com, has been a bit more platform agnostic. He composed this article in an Outlook 2000 plain text message window, and scribbled this byline in a Microsoft Word 2003 document. The content could easily have been written in any application with a text field. So, why then is he still using Windows? Legacy, we think—he's not quite ready to switch over to a different evil.

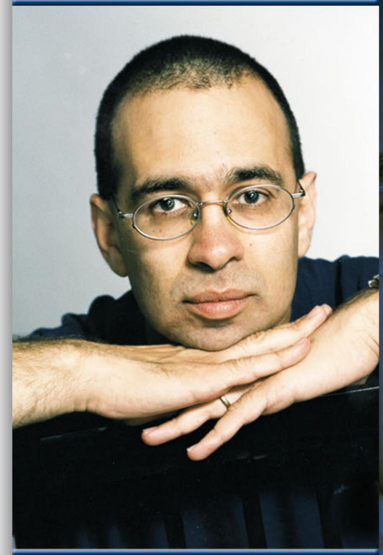
RC1 feels and looks more like an early beta than it does a final product, and they want me to fork over how much for it?

You can dialogue with Chris at chris@cpumag.com.

Open Sauce

When Open-Source *Doesn't* Make Sense

by Pete Loshin



Pete Loshin, former technical editor of software reviews for Byte *magazine (print version), consults and writes about computing and the Internet. He also runs www.linuxcookbook.com. He owns shares of both Microsoft and Red Hat and believes that Windows isn't for everyone, but neither is Linux.*

I'll say it again: Open-source software does everything I need and want at least as well as proprietary software. I try open-source programs for free and use them for free; I'm not locked into any vendor's upgrade schedule or proprietary file formats, and I get support via Google.

I frequently claim that open-source products still aren't the answer for everyone, but I've never elaborated on that claim. Until now.

It's great that open-source software comes with the source code and the right to copy, share, modify, and distribute it, but the fact is most users don't care about those things.

It's a different story for ISVs (independent software vendors), VARs (value-added resellers), system integrators, software service providers, consultants, and anyone who licenses commercial software for resale. They care very much about licensing. They do need to distribute, copy, share, and, especially, modify source code, and they don't want to make those modifications available to their competition or to potential customers at no cost.

Commercial open-source vendors could try to survive strictly by selling support and training. However, they increasingly dual-license their code (see last month's "Open Sauce" on page 83) to give VARs, ISVs, and the rest rights to redistribute that software under proprietary licenses. Even with a dual-license, customers receive the real benefit of using and examining source code from open-source vendors, but to play with the Microsofts and Oracles of the world, those vendors must deal with three major issues.

Number one: support—and not just a support line to take user questions, but a complete and comprehensive support infrastructure. This is a problem for any software startup company that may have only a few dozen (or even a few hundred) employees, especially when it must compete with established corporations employing thousands or tens of thousands.

Having offices in major cities around the world is a start, but real global support means having a global network of resellers, corporate partners, training providers, sponsored and unsponsored user groups, conferences, trade shows, certification programs, and integration with other popular products.

Red Hat is getting there, but other open-source vendors still have a way to go, if only because they still need to build their customer rosters to generate enough revenue to pay for such a network.

Number two: corporate stability and viability of the commercial open-source business model. Again, this is an issue that big companies buying lots of mission-critical software must take into consideration before they commit to any new software vendor. Businesses should conduct research with due diligence before investing in any new vendor. They won't buy unless they're confident the new vendor will be around to serve them next year.

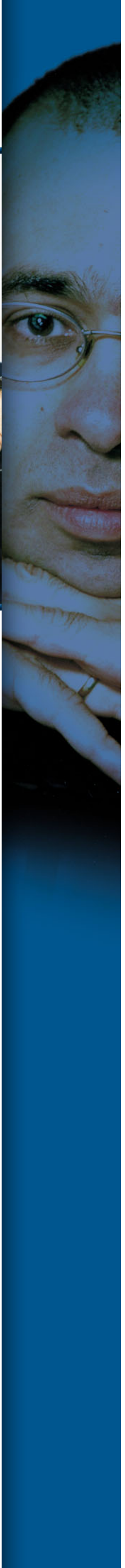
So far, only a few open-source startups have been around long enough to establish themselves; many depend on venture investors who seek only a profitable exit strategy. Even then, big, established companies have bought out most commercial open-source successes so far. That's not necessarily a problem, but it could be if your company does business with the competition.

And number three is product. Open-source vendors must deliver products at least as good as those from proprietary vendors. Feature sets and performance are important, but so is delivering an integrated and complete solution, compatibility with legacy systems, comprehensive programming tools, and usable interfaces. Ease of use is important, but ease of installation, configuration, and administration can be considerably more important to resellers and third-party support providers.

Don't get me wrong: I wholeheartedly support open-source software and expect it will continue to permeate and eventually dominate the world of computing. But for now, if your business depends on having reliable partners with big support infrastructures and products that solve your problems, proprietary vendors may still have an edge. For now. ▲

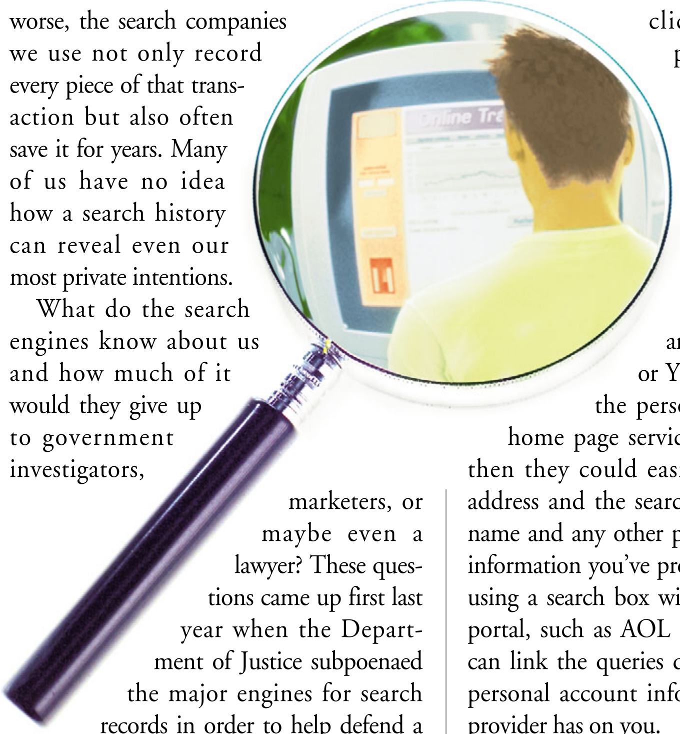
For now, if your business depends on having reliable partners with big support infrastructures and products that solve your problems, proprietary vendors may still have an edge.

You can get saucy with Pete at pete@cpumag.com.



Search Me?

What Search Engines Know About Us & Who They May Tell



Typing a word into an Internet search box is such an innocuous, common activity today that we barely consider it permanent, let alone threatening. But in fact, both our PCs and, worse, the search companies we use not only record every piece of that transaction but also often save it for years. Many of us have no idea how a search history can reveal even our most private intentions.

What do the search engines know about us and how much of it would they give up to government investigators, marketers, or maybe even a lawyer? These questions came up first last year when the Department of Justice subpoenaed the major engines for search records in order to help defend a controversial Internet antiporn law. Although Google resisted these efforts in court, other search engines complied with the request, insisting that online records didn't reveal individual users, just search patterns. But this incident raises important questions that remain to be answered about search engines and personal privacy: How much do the engines know about us from our searches and to whom can they hand over this record of our online activity?

What Do Search Engines Know?

Google is fairly typical in the information it gathers from your system and retains. According to the company's Privacy FAQ, it records every search query itself, the IP address from which it originated, the date and time of the request, the browser type and language used, any new or previous Google cookie ID for that PC, and the OS. But Google also admits to recording where you're clicking on a results page. So it isn't just saving your search terms for posterity but also a slice of your online behavior and the specific content you frequent. If you are registered and logged into Gmail or Yahoo! Mail or one of the personalized search and home page services at these engines, then they could easily associate the IP address and the search history with your name and any other personally identifiable information you've provided. And if you're using a search box within your own ISP's portal, such as AOL or Comcast, Google can link the queries directly to all of that personal account information the service provider has on you.

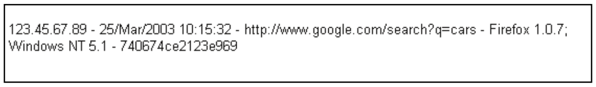
All of this data collection can end up carving many trails that an enterprising data miner could follow to find you. For example, Google, Yahoo!, and MSN could also associate specific search queries with a list of IP addresses. For instance, earlier this year journalist and search specialist John Battelle asked Google if it could put together a list of IP addresses that searched for certain terms, and the company said that theoretically it could. With this in mind, a search engine could conceivably ID all of the IP addresses that searched for "plastic explosives" or "child pornography."

But we the users are the primary big mouths when it comes to dumping private information into search histories, says Marcia Hofmann, staff attorney at EFF (Electronic Frontier Foundation). "A person wonders if her Social Security number is out there and types in her full name and number and driver's license. That information gets maintained as part of the full query." Whenever a person does a search about herself online (even directions from her own house), she is putting personally identifiable data into an otherwise anonymous search history.

How long the engines keep your history remains a mystery because almost all say that they retain server logs only as long as they remain "useful." AOL is the exception, though, claiming that it expunges search server logs every 30 days. Search companies use these logs to research consumer desire for new search products and new services for advertisers.

Who Else Knows

Only recently has it become clear how sensitive, intimate, and valuable search



```
123.45.67.89 - 25/Mar/2003 10:15:32 - http://www.google.com/search?q=cars - Firefox 1.0.7;
Windows NT 5.1 - 740674ce2123e969
```

This is an example of the typical line of data about you and your query Google collects. If you do the same search when logged into a registration-only service, such as Google Desktop, someone could link that query to you personally.

Q&A

Helen Nissenbaum: Debating Search Engines

Even media and privacy expert Helen Nissenbaum, associate professor at New York University, was surprised at the depth of information search engines retain about our online habits. She and Daniel Howe, a member of NYU's Media Research Lab, created one answer in TrackMeNot, a Firefox plug-in that masks search history with a flood of randomly generated searches. She spoke with *CPU* about why we need a policy debate about search and privacy.

CPU: What sort of controls should there be on search engines retaining our histories?

Nissenbaum: As users we need to figure out what policies to set for the proper use of this information that is good for everybody—for the society—and what is consistent with the values to which society ascribes.

CPU: Why is it important to protect search records?

Nissenbaum: There are certain types of information that touch on certain issues and need to be controlled to a greater extent. I think about search histories the way I think about lifestyle choices: The kind of activities that a liberal society believes should be under the control of the individual unless we have concrete reason to believe the person may do harm to others. They involve our identities, what we want to make of ourselves, what we care about, things that may have stigmas attached.

CPU: If search has become so important and personal so quickly, then should there be federal regulation over how search companies use and share that information with marketers?

Nissenbaum: I am hard-pressed to say exactly when we need federal legislation. When companies are almost compelled to violate people's privacy to maximize profits or else be at a competitive disadvantage, then that's the moment when regulation is not only good for users but for the companies. It allows all of them to be on a level playing field.

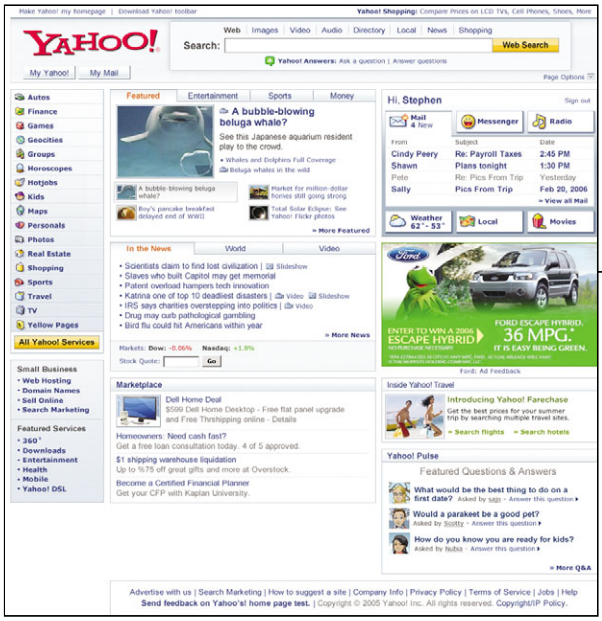
CPU: Do normal search and seizure constraints apply here?

Nissenbaum: That's the fourth amendment. It took 50 years for the courts to decide that using a telephone is a private speech zone. So when do we declare that the search box is a zone in which the fourth amendment applies?

server logs can be. Critics of the state of online privacy claim that the bar is set far too low for the government and the legal system to access citizens' search profiles. Federal law, namely U.S. Code 2703, lets government entities issue a warrant for stored electronic information or correspondence associated with a user without notifying that user. None of the search engines will disclose how many times their search records have been subpoenaed via lawsuits or government investigations.

Although the government has fairly ready access to online search behavior, the bar isn't set much higher for civil litigants. Many privacy experts warn that your former employer or ex-spouse's divorce attorney can subpoena a search company for your history. As the knowledge of the existence of search server logs proliferates, they may become popular targets for nuisance subpoenas or divorce cases.

And then there's the possibility that human errors in judgment or technological glitches could expose these databases of our online behavior to anyone. This issue moved from theory to reality last summer when an AOL researcher put 20 million search queries from 650,000 members online. The intention of this seemingly benign act was to help academics better understand search behavior, and the histories weren't attached to any overt personally



A bubble-blowing beluga whale?
See this Japanese aquarium resident play to the crowd.
• Whales and Dolphins Full Coverage
Beluga whales in the wild
A bubble-blowing beluga whale?
Market for million-dollar homes still going strong
Boy's pancake breakfast delayed end of WWII
Total Solar Eclipse: See Yahoo! Flickr photos

- Scientists claim to find lost civilization | Slideshow
- Slaves who built Capitol may get memorial
- Patent overload hampers tech innovation
- Katrina one of top 10 deadliest disasters | Video Slideshow
- IRS says charities overstepping into politics | Video
- Drug may curb pathological gambling
- Bird flu could hit Americans within year

Markets: Dow: -0.06% Nasdaq: +1.8%
Stock Quote: Go

From	Subject	Date
Cindy Peery	Re: Payroll Taxes	2:45 PM
Shawn	Plans tonight	1:30 PM
Pete	Re: Pics From Trip	Yesterday
Sally	Pics From Trip	Feb 20, 2006

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What would be the best thing to do on a first date? Asked by sajo - Answer this question
Would a parakeet be a good pet? Asked by Scotty - Answer this question
How do you know you are ready for kids? Asked by Nubia - Answer this question

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Yahoo!'s highly personalized services, such as its new customizable home page, can pass on to the search company enormous amounts of information about both your search and browsing habits.

identifying information. A firestorm of protest swept through the blogosphere and AOL quickly removed the histories from the Web. Although the published data was supposed to be anonymous, a *New York Times* reporter had no trouble using the search queries of one "anonymous" user to ascertain her identity. Considering all of the ZIP codes, map addresses, names, and personal tastes we usually insert into our search boxes, they easily create a highly specific trail than can lead to our doorstep.

Protecting Yourself

Although technology has advanced exponentially in the past two decades, our main protection against the search and seizure of our online activity remains the 1986 ECPA (Electronic Communications Privacy Act). Its narrow aim was to protect communications among private citizens. And yet it remains unclear whether the ECPA provides any real protection today for our transactions with companies such as Google or Yahoo!. Some argue that once you cede personal information to a company, you then tacitly give up many of your rights to keep it private.

Not much is being done to secure your search information online. Some in Congress say they will introduce legislation that forces search engines to dispose of server logs after a reasonable length of time. Hofmann feels search companies "have a responsibility not to keep [server logs] on hand because they *might* come in handy in the future." And yet, powerful entities in the Justice and Homeland Security departments resist that easy answer as shortsighted and knee-jerk. They would have search engines hold on to query records indefinitely because they could preserve a deeper trove of potentially criminal evidence. Who knows how these records might nail down some future charges against murderers or terrorists?

For law-abiding citizens, the only short-term answers to these still-new privacy issues may be in consumer advocacy and proactivity. At some point, users may gain the same access to their own stored search profiles that they now have to their credit history. Users could review, challenge, or expunge pieces of their own profile. Finally, there are techniques for searching the Web with relative anonymity (see the "Searching Securely" sidebar). Until an *offense* is available in the battle over the privacy of our search history, however, the best defense is a good defense. CPU

by Steve Smith

Search Securely

Don't like the idea that a search engine—or just a lawyer with a subpoena—might be able to track your online search history? There are some standard measures you can take to keep your Google and Yahoo! sessions relatively private.

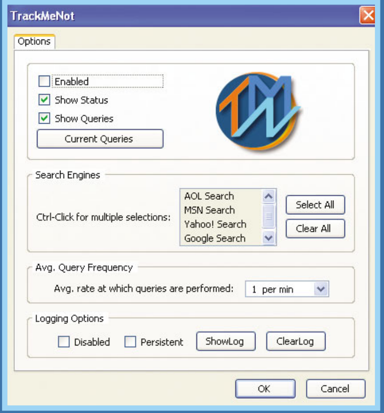
Don't do "vanity searches" on yourself that include personally identifying information such as phone numbers and Social Security numbers in a search query. This is the surest way to leak your identity into a search history.

Avoid using your own ISP's search service. Because the service provider, such as AOL or Comcast, already has detailed personal information on you and your IP address, someone could easily link these search histories to you.

Don't accept cookies from a search engine. Set your browser to its highest security setting so that any site must first ask permission to drop a cookie and then you have the opportunity to reject a search engine's request to install one. Most engines don't require you to accept a cookie in order to use their general services, such as search and maps.

Avoid searching when logged into one of a search engine's services. Yahoo! and Google's Web-based email as well as their personalized search and many other services require logins that make it easier to link your search history to your personal identity.

Try an anonymizer. For example, the NYU experiment, TrackMeNot (mrl.nyu.edu/~dhowe/trackmenot), is a Firefox plug-in that clutters your search engine history with nonsense searches and makes it more difficult for snoops to discern a genuine, meaningful pattern to your history. Also, we list several anonymizers in our "Stealth Surfing: Internet Anonymity Products Roundup" software roundup on page 71 this month that you can check out. ▲



☐ Enabled
☑ Show Status
☑ Show Queries

Ctrl-Click for multiple selections: AOL Search, MSN Search, Yahoo! Search, Google Search

Avg. rate at which queries are performed: 1 per min

☐ Disabled ☐ Persistent

The new TrackMeNot plug-in for Firefox tries to confuse, rather than circumvent, search history tracking by cluttering the record with random searches.

Infinite Loop

Wooden LED Clock

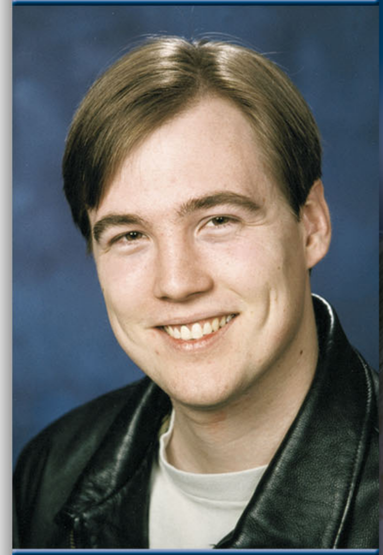
Source: www.bornrich.org/entry/wooden-led-clock

It's a strange concept, but a Japanese company by the name of Takumi has created an LED clock made of wood. No, that's not the strange part. The strange part is that when the clock is powered off, it looks like a simple block of wood. Priced at $469, this limited-edition clock isn't for those with just some loose pocket change, but the idea is an interesting one for those willing to invest. ▲

The Department Of Stuff

free20.txt

by Rob “CmdrTaco” Malda



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

The FSF (Free Software Foundation) was formed by RMS (Richard M. Stallman) in the ’80s. The fundamental belief of RMS and the FSF is that it is ethically wrong to legally prevent software from being copied. Because you can copy it infinitely at no cost, software should be copied. From this belief sprung forth the GNU Project, which provided new, free versions of most of the fundamental user commands in Unix. Stallman’s view is generally known as the “free software movement,” where “free” means not free as in cost, but rather free as in the freedom of speech granted to every American by our Bill of Rights. Or put simply, free speech vs. free beer.

In the ’90s a second viewpoint became popular. This was spearheaded more by people such as Linus Torvalds, the originator of the popular Unix derivative that derives from his name. Some of the developers of Linux believe what RMS believes: the ethics of free software. But others believe that by opening source code, by letting everyone tinker, we ultimately get better software. The proof is the Linux operating system: Different political beliefs fueled the developers behind it. Its license is more tolerant to proprietary modules. It’s free enough for most people, but not for RMS and the FSF.

But today we are approaching a new age in this debate. In this world of buzzwords, such as AJAX and Web 2.0, we see a bevy of applications that play host to our data: Flickr houses our photos, Blogger our blog, and YouTube might host a movie we have created.

Now the code that powers those systems may or may not be free. In most cases some pieces of it are, but the sum of the parts isn’t. Google is built on numerous open-source technologies, for example, but it’s not like you can download google.com, build it, and run your own search engine.

But each of these sites holds a piece of your data—the things you created. This is something the free software universe has dealt with before. If I write some code and contribute it to a project, now that project has a bit of me in it. My contribution was governed by the license the project maintainer chose—be it the GPL that powers much of the free software universe or one of the numerous less “free” licenses that sprouted like mushrooms through the last half of the past decade.

There’s a new issue for us to contend with, however, and it is in regard to your data—both the public content you might upload to a video site and the private information such as your inbox which a free Web mail service stores. Just who exactly owns your data when you put it on that free Web service?

We’ve seen strange historic events where public information was taken private. One of the craziest occurred when Gracenote took over CDDB (CD DataBase). At that point an open project with data maintained by thousands of volunteers was simply taken by a corporation and removed from the public domain and in its place stood a proprietary system that required a license fee.

These things can and will happen again. In some ways these issues are the logical extension of the issues raised decades ago by Stallman and the FSF. Who owns the data? What should you be allowed to do with it? If you create a mashup of three Web sites and sprinkle in your data, then who owns what? What obligations does each party have to each other and to the users who increasingly grow to depend on these applications?

These are questions that I have no good answers to. I think a good start is that we should all be looking at standard methods of data import and export. If I give a piece of data to a Web service, I should be able to export it in some simple, standard format. But there are many more questions: Can I delete my own data? Hide it? Choose to integrate it in a proprietary way with services from another site—from a competitor to the site I’m using?

Much of the end of the ’90s in the open-source and free software world was a debate over subtleties in software licenses. And I suspect that in the latter half of this decade we’ll have a bigger debate over the information we all choose to upload to Web sites. When it is all said and done, I hope our information remains in the hands of the right people. ▲

Contact me at malda@cpumag.com.

Just who exactly owns your data when you put it on that free Web service?

ROAD Warrior

by Jen Edwards

From Apex to Xantrex, Mobile Power Solutions Keep You Going

Two unique new mobile power products became available this month, each offering a different benefit to road warriors of all types. The first is the Apex Digital E2Go Double Charger, available in standard wall and automotive cigarette lighter versions. The charger has two charging cables attached and provides four times the power (2 amps) of traditional chargers, letting you charge two mobile devices at once, in approximately half the time of a single device-specific cable.

Because each of the charging cables features a Gomadic TipExchange connector, you can power any of literally hundreds of different devices, including mobile phones, PDAs, and MP3 players such as the Apple iPod, Creative, and Rio, to portable gaming devices such as the Sony PSP. The wall charger ($34.95) is ideal for home/office use and travel, while the auto charger ($29.95) will benefit true road warriors and help families travel in peace, since you no longer have to choose which device to change in a single car socket. Each charger comes with your choice of one TipExchange tip, with additional tips available for $4.95. All products are available now at www.gomadic.com.

Xantrex recently announced the XPower PowerSource Mobile 100, an all-in-one charging solution for mobile devices including laptops, PDAs, cell phones, and more. The unit is a 4.0A Lithium Ion battery pack that features two USB ports and one three-prong AC adapter port, allowing it to work with virtually any mobile device. If you're on the road, in a long sales meeting, or on a plane and start running out of power, plug your device's USB cable or AC adapter into the PowerSource Mobile for extra runtime or to charge a depleted battery. It can provide an extra 34 days of standby mode for a BlackBerry, two more hours for a laptop, 12 more hours of gameplay for a Sony PSP, or 72 extra hours of music when used with an Apple iPod nano.

The XPower PowerSource Mobile 100 comes with vehicle and airplane adapters that recharge the battery pack in almost any situation. Because it is designed to work with a large variety of devices, it also includes automatic over-temperature and overload shutoffs and an integrated GFCI circuit to prevent any potential damage to sensitive electronics. The XPower weighs in at just over 1lb and measures 5.4 x 3.3 x 1.6 inches (HxWxD), which can save a lot of space in your laptop bag since individual chargers and extra device-specific batteries will no longer be necessary. Although specific pricing and a release date have not yet been announced, at press time the XPower PowerSource Mobile 100 was available for preorder for $112.99 at Amazon.com. ▲

No Speakers Required

Samsung has just released the K5, the first digital music player with built-in speakers. Instead of limiting the user to headphones or a third-party speaker accessory, the K5 features a set of clear slide-out speakers in the bottom of the device that let you share music anytime, anywhere. The speakers aren't the only innovation you'll find in the K5, however, as it is also the first music player to include a 1.7-inch OLED color screen to display album art and digital photos; you can even create music slideshows to enhance the shared experience.

Additional features include an FM radio tuner and support for MP3 and WMA music, plus JPEG photos. Battery life is rated at 30 hours with headphones, or six hours when you use the speakers. Subscription services such as Napster, Rhapsody, Urge, and Yahoo! Music Unlimited are supported. The K5 is available in black in both 2GB ($209.99) and 4GB ($259.99) versions, with a pink model shipping before the end of the year. For more information or to find a local retailer, visit www.samsung.com. ▲

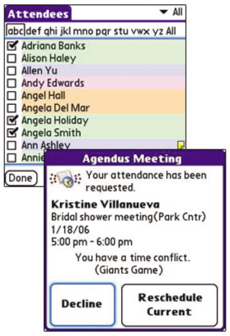
Give Your Device An InvisibleShield & Protect It Without A Case

Leather and/or metal carrying cases do a great job of protecting your PDA or cell phone, but they can add bulk and make it difficult to charge or sync your device. Carrying your device around *au naturale* isn't a great idea, either, as screen damage and scratches are almost inevitable—unless you cover your device with an InvisibleShield from ShieldZone. Unlike traditional screen protectors that cover only the delicate screen of your device, the InvisibleShield covers the entire surface of your cell phone, iPod, Nintendo DS or Sony PSP, and many other portable consumer electronics devices. Screen shields are also available for popular PDAs and GPS systems that can use full-body protection due to the need to access buttons and controls.

What makes the InvisibleShield different is the material, which was originally designed to protect the leading edges of helicopter blades from sand and dirt. The film is incredibly thin and supple, but it so strongly resists scratches and damage that ShieldZone offers a lifetime guarantee on the product. Traditional screen protectors generally become so damaged after a few weeks or months of use that they must be replaced, but if an InvisibleShield is ever scratched, the company will replace it for free. Full-body and screen shields are available for almost every mobile device available today, with prices starting at $11.95 for a screen shield and going up to $54.95 for a full-body shield for a 17-inch Apple PowerBook Pro. More information and online purchase available at www.shieldzone.com. ▲

Group Scheduling Made Easy With Agendus Premier

Agendus Premier is the newest addition to iambic Software's line of personal productivity software for Palm OS handhelds and includes three applications: Agendus Professional, Agendus Mail SSL Edition, and the Agendus Attendees Module. Treo smartphone users can schedule group meetings quickly and easily by selecting attendees from their address books, and Agendus Premier will automatically send meeting invitations via SMS. Attendees can accept or decline the invitation, even if they don't have Agendus installed, but if they have Agendus Premier, as well, additional features are available—the application will automatically check their schedules and warn of conflicting appointments.



☑ Adriana Banks
☐ Alison Haley
☐ Allen Yu
☐ Andy Edwards
☐ Angel Hall
☐ Angela Del Mar
☑ Angela Holiday
☑ Angela Smith
☐ Ann Ashley
☐ Annie

Your attendance has been requested.

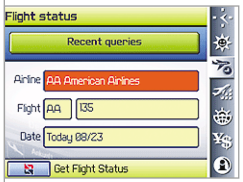
Kristine Villanueva
Bridal shower meeting(Park Cntr)
1/18/06
5:00 pm - 6:00 pm

You have a time conflict.
(Giants Game)

The application is ideal for small businesses and workgroups because it takes the hassle out of scheduling group meetings; with today's busy schedules, finding a free timeslot for multiple attendees can be quite a challenge. Agendus Premier also tracks invitations in real time, so users can see at a glance who will be attending or if the meeting needs to be rescheduled. Agendus Premier is $59.95, with special discounts available for users upgrading from previous versions of Agendus Standard or Professional. Visit www.iambic.com for more information about features and pricing. ▲

Get Real-Time Flight Updates With WorldMate 2006 Professional Edition For BlackBerry

WorldMate 2006 Professional Edition for BlackBerry keeps road warriors up-to-date with an impressive list of features; the latest edition offers real-time flight status updates that include terminal and gate information, as well as delay updates. Flight information includes data for more than 80 airlines, such as American, British Airways, Delta, Lufthansa, Northwest, United, and many other U.S. regional and international carriers.



Airline AA American Airlines
Flight AA 135
Date Today 08/23

Other features include comprehensive OAG flight schedules, weather forecasts, world clocks and alarms, currency converter and exchange rate information, and travel information with listings for airlines, hotels, and car rental services; airport and airline Web site addresses; and much more. WorldMate 2006 Professional Edition for BlackBerry is $59.95 and comes with a one-year subscription to all of the online flight information services; more information is available at www.mobimate.com. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

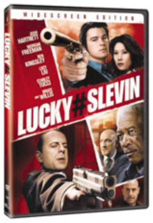
Audio Video Corner

DVDs by Chris Trumble, CDs by Blaine A. Flamig

$49.98
Universal Studios
www.scifi.com/battlestar

Battlestar Galactica: Season 2.5

Yep, we had some reservations back when the Sci-Fi Channel first started talking about a new Battlestar Galactica series, but here we are on the cusp of the third season, and we can't wait. As you would expect, the Season 2.5 DVDs contain the second portion of the second season (episodes 11-20), beginning with the end of the two-part episode featuring the return of Battlestar Pegasus. There are a couple of moments in this set where you'll scratch your head at the nearly inexplicable actions of a very important character or two, but by and large these episodes are of the same taut, well-written ilk as their brethren. Extras include an extended version of the Pegasus "midseason cliffhanger," commentary, and video blogs by executive producer David Eick. Better frakkin' get it.



$29.95
Weinstein Company
www.slevin-movie.com

Lucky Number Slevin

"Slevin" is a smart, often funny crime drama that tells the story of . . . well, we can't really say much about it without giving away important plot points. But it's a story of mistaken identity, decades-old vendettas, and a "Kansas City shuffle" (think misdirection). In case you're still not intrigued, check out the highlights from the cast list: Josh Hartnett, Bruce Willis, Lucy Liu, Morgan Freeman, Sir Ben Kingsley, Stanley Tucci, Danny Aiello, and Robert Forster. The DVD's special features lineup is pretty standard but the movie is excellent, and video and sound quality are right on.

$20
Capitol Records
www.bobseger.com

Bob Seger—"Face The Promise" (CD & DVD)

What Lynyrd Skynyrd still means to southern rock, Bob Seger and The Silver Bullet band was to Midwestern rock in the 1970s and '80s. 1976's "Night Moves" is still one of the best albums of its generation, and Seger's lovelorn ballads and hard-rocking anthems will be staples of classic rock radio for years to come. Recently inducted into the Rock and Roll Hall of Fame, Seger is back after more than 10 years away with 12 new songs that recapture at least in part the heartland-breed, working-man, from-the-heart sound that's helped him sell millions of records. The bonus DVD includes interviews, studio and concert footage, and videos. "Rock and Roll Never Forgets" indeed.

$25
Capitol/IRS
www.remhq.com

REM—"And I Feel Fine: Best of the I.R.S. Years 1982-1987" (Collector's Edition)

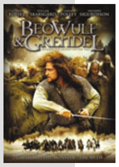
Before REM headed to greener and wealthier pastures with Warner Bros. Records in 1988, it released five stellar albums on IRS. This era of pioneering music gained REM a large, loyal audience and made it a darling of college radio and alternative rock. This two-disc release, which REM's original members helped compile, marks the 25th anniversary of the band's first release. Disc 1's 21 gems demonstrate perfectly why REM was as influential as any band in the 1980s. Disc 2 has the band's personal picks, previously unreleased tracks, and alternative takes.

See the full reviews from A/V Corner at www.cpumag.com/cpunov06/AYL

DVD Byte

September 26

The Texas Chainsaw Massacre: 2-Disc Ultimate Edition



Beowulf & Grendel

A Slight Case of Murder

October 3

X-Men: The Last Stand

Thank You For Smoking

Lock, Stock and Two Smoking Barrels: Locked 'N Loaded Director's Cut

October 10

Simon & Simon: Season One

A Prairie Home Companion

Harvey Birdman, Attorney at Law: Volume 2

October 17

The Omen

The Break-up

Big Love: The Complete First Season

CPU Game Of The Month

COMPANY of HEROES

A New RTS Benchmark -*by Dr. Malaprop*

$49.99 (PC); $59.99 (Collections Edition DVD-ROM) • ESRB: (M)ature • THQ • www.companyofheroesgame.com

Relic Entertainment has released one of the best World War II real-time strategy games we've ever played. The first things you'll notice when playing Company Of Heroes are the game's superb presentation and production values. Visually, COH looks fantastic and will tax high-end rigs when you crank it up. (*NOTE: The game had performance issues on our SLI machine until we installed the 1.2 patch.*)

COH has a tutorial that teaches you the game's basic and advanced control concepts. It won't take long if you've played Warhammer 40K: DOW to recognize many of that game's core elements in COH.

COH is an RTS, and the three main resources are Manpower, Munitions, and Fuel. There are, of course, two sides: Axis and Allies. You'll need to capture enough points on your map to build and enhance your troops and equipment. Having the enemy cut off a sector between two resource points will cut off supplies from the noncontiguous one. This forces you to maintain defenses in captured sectors while pushing your troops into new sections. The effect on you is a lot of harried micromanagement because you're often fighting on numerous fronts during a single mission. You control squads (not the individuals), but it's delightful to see the AI actually live up to its moniker in the way it guides the individual soldiers in the squad as they take orders and seek cover as necessary. You can spend your time playing and strategizing without having to babysit your troops. What a difference that makes! As your squads and vehicle units gain experience, you'll have the option to use power-ups to enhance them. Then there's the online mode, which lets you play in teams with the Axis pitted against the Allies.

The on-screen environments and mayhem impact the game; for example, everything you see on-screen translates into intense tactical and strategic elements related to the gameplay. COH is not just intense because of the numerous concurrent combat situations; it's intense because the on-screen representation effectively pulls you into the era. It's intense because you actually care for your troops and feel motivated to fight. Also, it's not often RTS games get props for audio, but in addition to a good musical score, Relic has created sound effects that are incredibly successful in building combat tension and communicating what you're seeing in the battles.

It may initially be easy to overlook COH because of its long-in-the-tooth WW2 setting, but that would be a big mistake. Intense gameplay, extraordinary artwork, effective audio, smart AI (except for some unit path-finding issues), destructible environments, riveting combat, and the feeling of authenticity are amongst the best we've experienced in an RTS. If you take pride in being a PC gamer and have even a passing interest in strategy games, this is the one release you shouldn't miss. It's the type of game that a console just can't replicate as effectively. Company Of Heroes is a masterpiece that sets a benchmark for the future of RTS gaming and design. ▲

MADDEN NFL 07

Don't Call It A Comeback

-by Chris Trumble

$59.99 (Xbox 360) • ESRB: (E)veryone

EA Sports • www.easports.com/madden07

Last year's Madden NFL 06 for the Xbox 360 was a beautiful but flawed game that felt like EA had rushed to put something together that took advantage of the 360's graphics capabilities at the expense of some fairly basic features. The Xbox 360 version of Madden NFL 07 isn't perfect, but it is a vast improvement and corrects several of the previous version's glaring omissions.

For starters, you can challenge plays and initiate instant replay reviews again, one change we wholeheartedly approve of. In fact, it may be our favorite fix in 07 for the simple reason that it's more vital to recreating the NFL game experience than, say, the create-a-player mode that went missing last year. Including replay adds another element of the strategic aspect of playing head-to-head against live opponents—not to mention further opportunities to talk a little smack.

Other returning features for the 360 version include a superstar mode, which happily focuses on football and cuts away the silly PR stuff from past incarnations, and a beefed-up franchise mode that's more like what the PS2 and Xbox versions have had for years. There are likely plenty of Madden fans who'll never even touch these modes, but once you get used to them, they add considerable depth to the Madden experience, and we're happy to see them this year.

The big new features for this year are the ability to control your lead blocker when carrying the ball and the highlight stick. Lead blocker control is a great addition and yields some impressive benefits when you get a handle on it, and the highlight stick is sort of the offensive counterpart to the Hit Stick that first appeared in Madden 2005.

Although it doesn't look markedly different from the 06 Xbox 360 version, Madden 07 looks great as expected. Audio is decent, as well, with similar play-by-play presentation and musical transitions. In short, aside from a few glitches that EA will likely patch, Madden NFL 07 for Xbox 360 is what last year's version should have been: a great-looking football game with the fundamentals intact. ▲

LEGO STAR WARS II

THE ORIGINAL TRILOGY

Charmed By The Force

-by Dr. Malaprop

$49.99 (360); $39.99 (Xbox, PS2); $29.99 (PC) • ESRB: (E)veryone

LucasArts • www.lucasarts.com/games/legostarwarsii

Our first hands-on experience with Lego Star Wars in spring 2005 caught us off-guard. We expected a trite children's title, but discovered a fun, charming experience filled with warm humor. Having the new "Star Wars" trilogy source material didn't work against the title, and it turns out the game amply entertains all ages.

Lego Star Wars II: The Original Trilogy retains the familiarity of the first game (action, adventure, puzzles, and character types) but with improved back stories based on film Episodes IV, V, and VI. LucasArts breaks down LSWII into three episodes corresponding to the original trilogy. Each episode consists of six stages; completing the various stages unlocks other characters that become available when you play through the game in Free Mode (available after you first complete the game). You'll have more than 50 characters to choose from. Using the Character Customizor to create your own nearly limitless abominations based around Lego and the "Star Wars" universe is fun.

Vehicular battles play a larger role, and you'll have the opportunity to pilot a landspeeder and snowspeeder among others. These sequences look superb, but they could've benefited from tighter controls. Another player can jump in with a second game controller to provide help, but the co-op Xbox Live support is missing again.

The console versions of the game plays similarly. The title looks pretty good on all platforms. At the end of the day, LGSII will provide you, your friends, and your family with ample entertainment value. ▲

Saints Row

Grand Theft Flattery

-by Dr. Malaprop

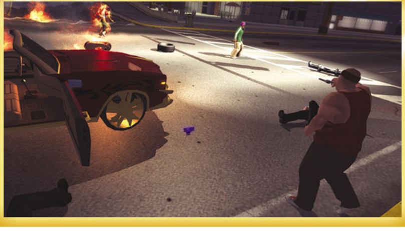
$59.99 (360) • ESRB: (M)ature • THQ • www.saintsrow.com

If imitation is the sincerest form of flattery, then developer Volition is flattering the hell out of GTA3, Vice City, and San Andreas with Saints Row. For the time being, Saints Row hogs the spotlight as the only next-gen, urban open sandbox game in town. Though it may conceptually have much to share with the recent Grand Theft Auto games, Saints Row introduces its own sense of polish and style.

The game begins with your character in the wrong place at the wrong time as Stilwater's three main gangs battle it out in a neighborhood. At the last minute, Julius of the Third Street Saints saves your life and now its time to take over the entire city. The mission structures offer plenty of variety with regard to the storylines for the various neighborhoods, but most are limited to some degree of driving, gunning, or both. You can gain respect, needed to access higher-level missions, by engaging in all manner of activities. The game design is completely free-form, so you can roam through any part of the city on your own agenda.

Graphically the game looks superb and features excellent use of physics. We noticed the frame rate bog down in certain crowded missions, but overall Saints Row is a feast for the eyes. One new feature it touts is the multiplayer mode, which is better in concept than practice. Control of your character and vehicles is an improvement on the GTA games and is part the reason we spent many hours playing.

As it turns out, the only free-form, urban sandbox game on 360 happens to feature solid gameplay, so if this type of gaming is your bag, look no further. We don't expect GTA4 until late 2007. ▲



TEST DRIVE Unlimited

Exotic Open-Island Racing *-by Dr. Malaprop*

$39.99 (360) • ESRB: (E)veryone • Atari • www.testdriveunlimited.com

Bored of the cut-and-dried boundaries between single- and multiplayer racing? That's apparently what the developers behind Test Drive Unlimited had in mind, too. Eden Studio's solution was to build an online world modeled after the Hawaiian island of Oahu. Unlimited combines several features: a re-creation of Oahu with more than 1,000 miles of road; tons of drivable, exotic cars to match the locale; and the ability for players to race other real players while seamlessly exploring the island.

It's not very often the average gamer has an opportunity to cruise over to Pearl Harbor to sightsee in a Ferrari. And real-world drivers in Aston Martins and Lamborghinis challenging you is pretty unusual, too. This is an A-list game at a budget price, but one that you might avoid if you don't have Xbox Live Gold. The single-player game is tepid and not challenging. The game comes into its own when you're out driving and super-cars/bikes racing each other are passing you. Just having real drivers on the road functioning independently of your gameplay makes the world intriguing.

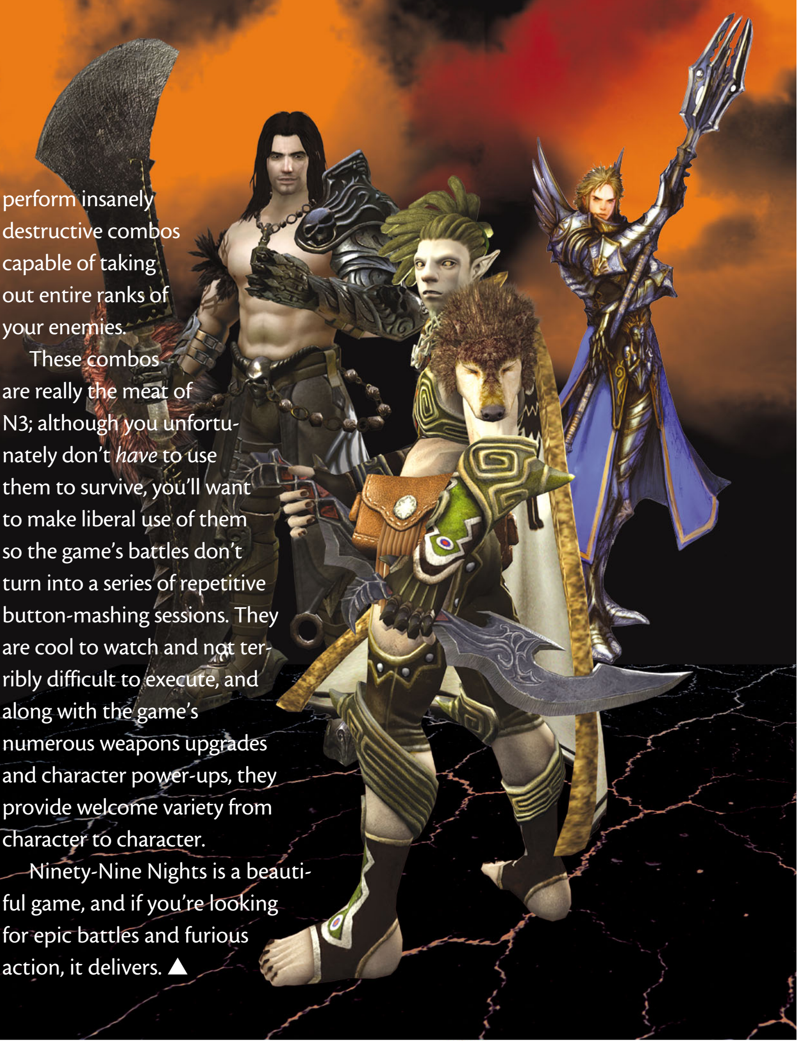
Your competitive focus will include racing (obviously), delivering/escorting cars, and exploration. There's not much to the missions: After a few hours, the mission structure may feel repetitive, but because the game is unscripted, you have ample variety in the types of races you can find. The cars don't handle as well as they do in PGR3 but are responsive enough to permit a mostly enjoyable driving experience. Don't overlook Test Drive Unlimited if you're fan of arcade-style racers; there's much to like about this game. ▲

N3
ナインティナイン ナイツ
NINETY-NINE NIGHTS™

Beat Up A Cast Of Thousands

-by Chris Trumble

$49.99 (Xbox 360) • ESRB: (M)ature • Microsoft Game Studiosv • www.xbox.com



Anyone who's ever played Koei's Dynasty Warriors/ Samurai Warriors games will be instantly familiar with Microsoft's Ninety-Nine Nights. As in the Warriors titles, your characters are massively powerful warriors who lead large armies into enormous battles to achieve certain mission goals on your way to unraveling a story that in this case is a swords-and-sorcery-caliber fantasy.

When you first glimpse the size of the forces involved in its battles and read your mission objectives, it might appear that N3 is a military strategy game, but in truth your characters' armies are mostly window dressing. If you are sufficiently aware of your surroundings, you can move through battles in such a way that your troops will help to keep you from being overwhelmed (pick and roll, anyone?), but you can't rely on them to destroy much of an opposing force. That responsibility falls firmly on the shoulders of your characters, who in addition to having massive, powerful magic weapons also possess the ability to perform insanely destructive combos capable of taking out entire ranks of your enemies.

These combos are really the meat of N3; although you unfortunately don't *have* to use them to survive, you'll want to make liberal use of them so the game's battles don't turn into a series of repetitive button-mashing sessions. They are cool to watch and not terribly difficult to execute, and along with the game's numerous weapons upgrades and character power-ups, they provide welcome variety from character to character.

Ninety-Nine Nights is a beautiful game, and if you're looking for epic battles and furious action, it delivers. ▲

Yakuza™

All In The Family

-by Chris Trumble

$49.99 (PS2) • ESRB: (M)ature • Sega • www.sega.com

Yakuza is Sega's take on the organized crime-themed games that have been so prevalent of late, but don't write it off as a simple GTA clone. Yakuza drops players into the role of Kiryu Kazuma, an enforcer in the Japanese mafia who is looking to start a family of his own, and the locations, mechanics, and storyline are all drastically different from other entries in the genre.

For starters, although there is weapons-based combat in the game, Yakuza is largely a hand-to-hand fighting game with elements of 3D fighters like Tekken and DOA. There are a number of combos you can learn and use with profound effect, as well as a "heat mode" that lets you pull off devastating attacks when your meter is sufficiently full, complete with brutal animations of bone-jarring smackdowns.

The other big difference between Yakuza and the rest of the pack is its lack of driving; Yakuza keeps your feet planted firmly on the ground (and often in your rival's chests). The game takes place within a fairly small area, but it's a notable difference nonetheless.

Yakuza's gameplay is fun if a bit repetitive at times, and the story and unique setting lend it an air of freshness. Our only big complaints with the story are that the whole "mobster with a heart of gold" angle wears pretty thin at times—Kazuya brutalizes others for financial gain, after all—and that the dialogue often seems to include scads of profanity just for profanity's sake. Still, Yakuza is one of the better current PS2 offerings and is well worth a look. ▲

by Barry Brenesal

Look! Word Processing Software!

To most of us, it's transparent. We were teethed on it, and now it's simply an extension of a desire to write. But for others like myself, word processing software was a boon when for decades we'd dealt with pencil edits, typewriter ribbons, and Wite-Out. (Fair warning: I'll throw an old Remington No. 2 at the first person who asks whether I helped Gutenberg set his earliest books in moveable type.) So when did word processing software become the cutting edge?

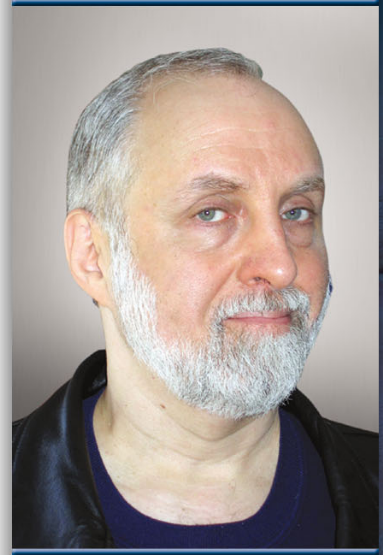
The term "word processing" itself dates back to the 1950s, when Ulrich Steinhilper, an IBM salesman, provided the catchy translation for the German word Textverarbeitung, which he meant as typing. (This was quite possibly the only occasion on which a former member of Jagdgeschwader 433, part of Germany's air war against Britain during WWII, made a significant contribution to the computer field.) IBM latched onto and repeatedly revised it over the next 20 years to suit new developments in its typewriting technology. But it really didn't come into its own until the late 1970s, when the proliferation of personal computers and software made home-based word processing both possible and financially feasible.

In retrospect, 1978 was one of the red-letter years for the word processing industry. Marketing genius Seymour Rubinstein had started a company called MicroPro International with $8,500, programmer Jon Robbins Barnaby, and the idea of designing a word processor that wasn't coded into a hardware system. They released WordStar 1 for CP/M. (They later issued a version 2, but it was copy-protected. Rubinstein somehow didn't foresee that people would avoid a copy-protected WordStar by the droves, and another version was hastily prepared.) Over the next few years, the company consolidated a lead on the burgeoning word processing market thanks to WordStar's operational speed, mnemonic command set, and increasing range of attractive features. It was truly the cutting edge for a while.

But by the late 1980s the Golden Age of PC-based Word Processors had arrived—by which I mean a period when more word processors were available, catering to the diverse needs of various groups, than at any other time. There were the two battling lions of the field, WordStar and WordPerfect, greedily pursued by newer feature-laden contenders such as XyWrite. Several others, like My Word!, were compact WordStar clones designed for low-end systems and requiring next to no memory; one called ZenWord even had an "it learns as you type" feature to enter long words as you began typing them. Then there were the specialty word processors, such as MASS-11 for engineers and Nota Bene for academics. Best of all, with the addition of an Intel 80386 processor and Quarterdeck's DESQview, it was possible to easily multitask any of these word processors with a host of other software. *PC Magazine* did a roundup in 1988 of 55 word processors. It was a good time to be alive.

Matters changed soon after that. WordStar's developers pulled a New Coke by abandoning traditional WordStar development for some time in favor of WordStar 2000, a product with no user base and a different command set. Meanwhile, powerful WordPerfect was taking advantage of MicroPro International's stumble, and Microsoft was using proprietary internal links to make the company's word processor, Microsoft Word, a natural choice in their competitive multitasking GUI, Windows 3.0. That version of Word had a number of features that were abandoned after the competition from DOS-based word processors died out, such as the ability to rearrange the command system to imitate either WordPerfect or WordStar.

These days, Word enjoys a near monopoly in Windows, and as usually happens with monopolies, development of the word processor has been allowed to lag. But for those who want other features and will pay the price, a few old stalwarts such as WordPerfect and Nota Bene still exist, pursuing their own individual goals. Me? I use Word, grumble and hesitate perennially over Nota Bene's price tag, and keep a copy of WordStar 5.5 for DOS on my bookshelf as a memento of better times, when one size was never meant to fit all. CTRL-K+D, anyone? ▲



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.

In retrospect, 1978 was one of the red-letter years for the word processing industry.

Wax nostalgic with Barry at barry@cpumag.com

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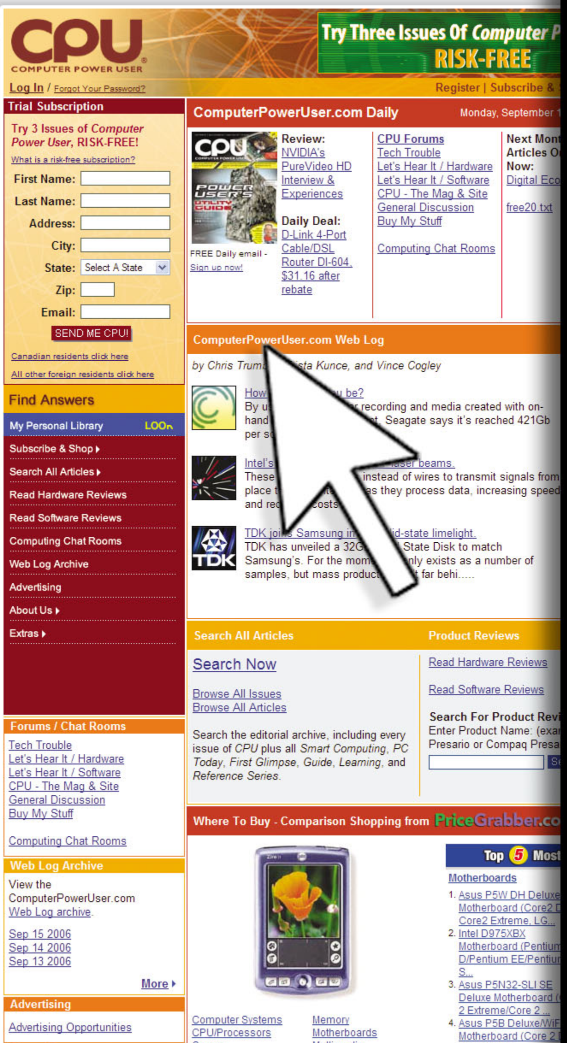

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These instead of wires to transmit signals from place t as they process data, increasing speed and re costs

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Software Tips & Projects

Virtual PC Tricks: Part 2

At the heart of the Web 2.0 concept is the idea that common desktop operations will migrate to the Web. Last month we looked at a few of the tricks you can do with Google Calendar, as well as some online word processors and storage services. This month we'll drill into a few of the more obscure and newer experiments in Web-based desktops.

Pile On The Writely Files

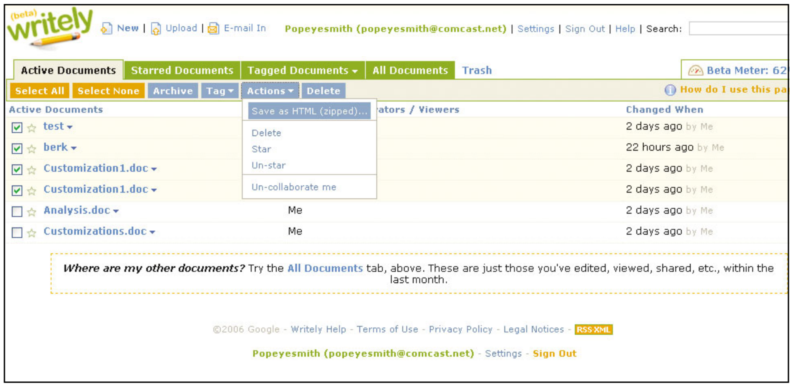
Writely (www.writely.com) is a recently relaunched Web-based word processor from Google that rivals Word in its functionality. Ordinarily, Writely only lets you upload one Word or image file from your PC at a time into the service, but there's a way around this. After signing into Writely, click the E-mail In button. Here you'll get a unique email address for your Writely account. You can send single or multiple documents (up to 500KB) or images (up to 2MB) to this address and Writely will convert them to separate HTML documents. These uploaded files will retain their original file names. Also, any text you include in the email will become a new document that uses the email subject as its file name. All of these attachments will show up in your All Documents folder.

As of this writing, Writely had limited ability to download files to your PC in batches. You can download batches of files, however, if you don't mind Writely converting them to HTML. Go to the All Documents tab, check the files you want to download, click the Actions drop-down menu and Save As HTML, and your files should download to your PC as a compressed Zip folder.

Your Super Page

If you think MyYahoo! is a home away from home, you ain't seen nothing until you try Netvibes (www.netvibes.com). This service lets you move much of your desktop functionality to the Web so that it's available everywhere. For instance, once you create an account in Netvibes, you can click the title at the top of the page to rename your page, and you can create a multisheet home page by creating tabs below the title. If you click the down arrow on the active tab, you can customize each page by changing the icon for the tab or segmenting the format up to four columns.

In the upper-left corner of the page, click Add Content to see a list of options. Here you can feed your Yahoo! Mail and/or Gmail accounts into this page or import your bookmarks by clicking the Bookmarks icon. Netvibes is designed to pull down



	Active Documents	ators / Viewers	Changed When
☑ ☆	test		2 days ago by Me
☑ ☆	berk		22 hours ago by Me
☑ ☆	Customization1.doc		2 days ago by Me
☑ ☆	Customization1.doc		2 days ago by Me
☐ ☆	Analysis.doc	Me	2 days ago by Me
☐ ☆	Customizations.doc	Me	2 days ago by Me

Where are my other documents? Try the All Documents tab, above. These are just those you've edited, viewed, shared, etc., within the last month.

Writely lets you download batches of your stored documents by converting them into HTML.

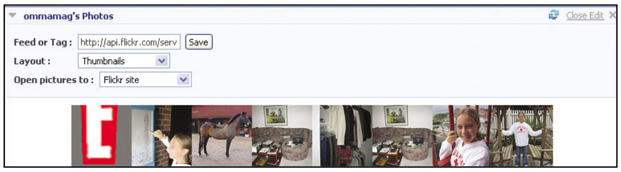
WinXP Tip Of The Month

If you're tired of the plain DOS-like look and feel of the Command window, then customize it. Click Start and Run, type **cmd** in the Open field, and click OK. Now click the C:\ prompt icon in the upper-left corner of the window and Defaults to bring up the Console Windows Properties window. Here you can change most of the Command window's look and feel, from the cursor size to the default font, text, and background colors. Use the tabs to rifle through the options and click OK when you're finished.

Registry Tweak Of The Month

When you click the arrow on the Address bar in Internet Explorer, you'll see a drop-down list of all the URLs you've typed in recently. Many of them may be addresses you'll never use again, and yet they can get in the way of others you frequently use. You can delete or edit this list in the Registry by clicking Start and Run, typing **regedit** in the Open field, and clicking OK.

Next, go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\INTERNET EXPLORER\TYPEDURLS key. Each Value Name in the right-hand pane corresponds to a URL listing in IE's drop-down history. To delete any URL, right-click it and select Delete.


ommamag's Photos

Feed or Tag : http://api.flickr.com/serv

Layout : Thumbnails

Open pictures to : Flickr site

You can pull into a single personal home page several of the Web 2.0 projects, such as your Flickr photos, del.icio.us bookmarks, or collaborative Writely documents, with Netvibes.

new email from your POP3 server (click the PopMail link), as well, but this gave us trouble in the early version. (See "Desktoptwo Go" for a better integration of POP3.)

Nevertheless, Netvibes gathers several of the Web 2.0 projects already online such as Flickr, Digg, and Meebo (see below). For instance, you can feed your Flickr photos into this home page as thumbnails or a slideshow. To do this, click Add Content and then Flickr Photos. In the pop-up window, click Edit and paste the RSS URL for your personal photos page into the Feed Or Tag box. Click the Layout drop-down arrow to choose Thumbnails or Slides and then click Save. Click Close Edit and you should see your current images on the page. To get the RSS feed for your image page, go into your Flickr account and find the image page you want to import. Right-click the Subscribe icon in the lower-left corner of that page, click Copy Shortcut, and then paste this into the Feed Or Tag box.

IM Everywhere

The problem with IM software, even the cool clients that aggregate multiple accounts, is that it stays with your PC. Sure you can download the software onto someone else's machine, but that can be rude or, worse, make it easy for that PC's owner to log back onto your IM account. Meebo (www.meebo.com) offers a better Web-based approach that lets you log into Yahoo!, AIM, Jabber/GTalk, or MSN IM from a single screen and from any Web browser. Meebo generates an in-browser IM client that aggregates your buddies across all accounts. You can also combine this functionality with Netvibes to make Meebo a dedicated tab on your home page.

Desktoptwo Go

There are a number of "virtual operating systems" in alpha and beta stages that try to re-create a PC desktop in a browser, but far and away the most impressive we've seen is Desktoptwo (desktoptwo.com). Create an account with Desktoptwo and you get a browser-based desktop, complete with icons for email, hard drive, MP3 player, and more.

Better still, Desktoptwo integrates the OpenOffice.org software suite into its browser-based OS. If you double-click an uploaded DOC, XLS, or PPT file on the virtual hard drive, the OS asks if you want to open the file with a remote or local application. If you choose Remote Program, then Desktoptwo will launch the file in the browser window using OpenOffice. You don't even need to worry about having the compatible applications locally to work with common files. You can access all of the OpenOffice programs by clicking your username in the bottom-left corner of the screen and then selecting Applications, Programs, and OpenOffice. Alas, in this early version of Desktoptwo there's only 1GB of space available, but that should be enough for most work files.

Another thing to love about Desktoptwo is its excellent POP3 email client, which can access your main email account in an Outlook-like interface from anywhere. On the virtual desktop, double-click the E-Mail icon and then click the Preferences tab. Click the POP Accounts tab to add a new account by entering all of your login and server information. Remember to keep the check in Do Not Delete Messages On The Server box, which ensures that all of your messages will remain available to you at home. CPU

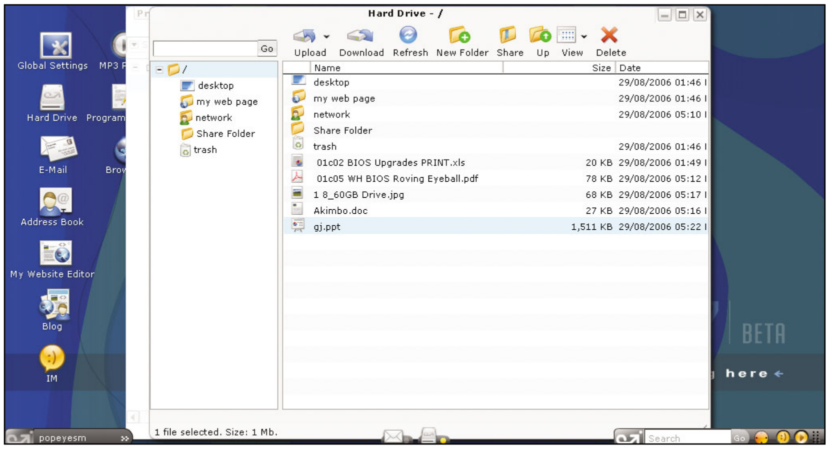
by Steve Smith

Infinite Loop

I Want Money, Lots & Lots Of Money

Without a doubt, plastic money is taking over the world and now it has crossed into our fictional Monopoly lives, as well. The makers of Monopoly have decided to get with the times by replacing Mr. Moneybags' pocket cash with a fat wallet of credit cards. Players who are seeking the thrill of getting rich can swipe away their purchases and debts, instead of forking over the multicolored cash. We can only wonder what mathematical harm this will cause future generations and how Mr. Moneybags' credit score will hold up. ▲

Source: www.engadget.com/2006/07/24/monopoly-ditches-cash-goes-plastic


Hard Drive - /

Name	Size	Date
desktop		29/08/2006 01:46
my web page		29/08/2006 01:46
network		29/08/2006 05:10
Share Folder		
trash		29/08/2006 01:46
01c02 BIOS Upgrades PRINT.xls	20 KB	29/08/2006 01:49
01c05 WH BIOS Roving Eyeball.pdf	78 KB	29/08/2006 05:12
1 8_60GB Drive.jpg	68 KB	29/08/2006 05:17
Akimbo.doc	27 KB	29/08/2006 05:16
gj.ppt	1,511 KB	29/08/2006 05:22

1 file selected. Size: 1 Mb.

With Desktoptwo you can upload most common data file types and even launch and edit them in browser-based versions of OpenOffice.

Warm Up To Penguins

The Joy Of Text

In the beginning there was ASCII, and everything was compatible with everything else. ASCII is still the underlying format for everything from source code to HTML and XML documents. Most text-based tools are cross-platform, but few OSes make text easier than Linux.

ASCII text uses seven bits to encode 95 printing characters (a through z, A through Z, punctuation, and symbols) and 33 nonprinting characters (such as backspace and carriage return) that all computers understand. Most text editors default to American English, but you can usually change them to use any ISO character set.

Text editors produce raw text files and programming editors display source code formatted for different programming languages, highlighting missing syntax elements. Word processors and desktop publishing programs produce formatted documents with various fonts, graphical elements, and other visual flourishes.

Choose A Text Editor

The big two editors are Vi (pronounced "vee eye") and Emacs. Both are actually families of functionally equivalent editors: Linux default implementations are VIM (Vi, Improved; www.vim.org) and GNU Emacs (www.gnu.org/software/emacs).

Real old-school *NIX gurus know and use both Vi and Emacs: Vi for fast, simple jobs and Emacs for more complicated tasks. For everyone else, however, Emacs works better as an all-around text editor. As a smaller program, Vi (see Fig. 1) loads much faster than Emacs and is built from the ground up as a programmer's editor. Emacs is designed to edit any kind of text file, and its built-in Lisp implementation makes possible source coding, outlining, document editing, to-do lists, contact files, calendars and scheduling, reading email and more. Emacs comes with a wide selection of such functions, as well as several text-based games including Tetris and Snake.

The Wonderful World Of Emacs

You can find Emacs in the GUI desktop start menu under Office Applications/Word Processing or Utilities/Editors. Also, you can start it as the shell command "emacs." When you start Emacs on the desktop, it opens the X-window GUI version; when X isn't running you get the character-based version. If you want the non-GUI version in a shell window on your desktop, start Emacs with "emacs -nw." (Fig. 2 shows Emacs running as both a GUI and command line application .)

Emacs keystroke commands begin with the Control or META character, which represents either ESC or CTRL-ALT pressed simultaneously. META varies because not all systems have the same control keys.

When running in X, access Emacs functions from the pull-down menu. Or in text-only mode you can access the menus by pressing "META `": Press ESC (or ALT/CTRL) and release and then press the back-tick key (`) directly below ESC.

Emacs newbies should go immediately to the menubar and select Help/Emacs Tutorial to learn basic commands such as opening, saving, and closing a document, opening and manipulating windows and buffers, understanding what windows and buffers are, and how to execute commands.

Like almost everything in Emacs, you can invoke the Help tutorial with a keystroke combination, CTRL-H T: First press the CTRL key and the letter H at the same time and then let go and type T.

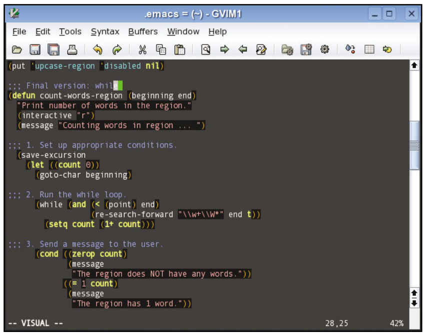
There are several other important commands. For quit: CTRL-XC (hold down CTRL and press X and then hold down CTRL again and press C). Save is CTRL-XS. You can open a new file in the current directory, which displays in the minibuffer the bottom line of the window where you can edit commands, with CTRL-XF, and then type the file name. If you want to choose from the list of all files in the directory, just press BACKSPACE to delete the backslash symbol (/) in the minibuffer.

The key to Emacs is getting started with a few commands for navigating within a document, switching among "buffers" (the files that you're actively editing), and selecting, cutting, pasting, and moving text .

Customize Emacs

Emacs by default is pretty basic, so you'll want to look into the Emacs configuration file, .emacs, in your home directory. Configurable options are almost endless, and you can explore them through Options/Customize Emacs.

One of the first changes you'll want to make is to enable your mouse scroll wheel. Go to Options/Customize Emacs/Browse Customization Groups, click Environment,



```
(put 'upcase-region 'disabled nil)

;;; Final version: while
(defun count-words-region (beginning end)
  "Print number of words in the region."
  (interactive "r")
  (message "Counting words in region ... ")

;;; 1. Set up appropriate conditions.
  (save-excursion
    (let ((count 0))
      (goto-char beginning)

;;; 2. Run the while loop.
      (while (and (< (point) end)
                  (re-search-forward "\\w+\\W*" end t))
        (setq count (1+ count)))

;;; 3. Send a message to the user.
      (cond ((zerop count)
             (message
              "The region does NOT have any words."))
            ((= 1 count)
             (message
              "The region has 1 word."))
-- VISUAL --                                    28,25          42%
```

Fig. 1. Vi is a programmer's editor, highlighting syntax elements in source code. In this case, the source code is the Emacs configuration file.

scroll down to Mouse Group, and click the Go To Group button. Toggle the Mouse Wheel Mode to On, click Save Changes For Future Session at the top of the page, and the wheel should work the next time you start Emacs. Changes you make this way are written directly into your .emacs file. You can also make changes manually.

Though you can change your default background and foreground colors through the menus, they're easy to change by hand:

```
(set-foreground-color "MidnightBlue")
(set-background-color "SkyBlue")
```

Not sure which colors you like? Go to Edit/Text Properties/Display Colors to see a complete list of colors with names that are available to customize your Emacs display.

Even though some describe Emacs as "modeless," it does have several modes that define how text is handled during the editing process. For example, if you load a source code file, Emacs may automatically start up a C++ programming mode so it displays and highlights your code according to C++ syntax. You can also set the mode Emacs uses by default by adding a line to your .emacs file:

```
(setq default-major-mode 'outline-
mode)
```

This line sets the outline mode as default and is useful if you use Emacs to create and edit outlines. If you just want to invoke outline mode during an editing session, you can do so with the command "ESC x outline-mode ENTER"; to return to text mode, use "ESC x text-mode ENTER."

Program With Emacs

If you're familiar with Lisp, you may have noticed that the lines you can add to the .emacs configuration file are simple Lisp programs. Although Emacs is powerful, it lacks functions word processors ordinarily include, but you can supply these by adding more interesting Lisp programs to the .emacs file.

```
;;; Insert current time
(defun insert-current-time ()
  "Insert the current time"
  (interactive "*")
  (insert (current-time-string)))
```

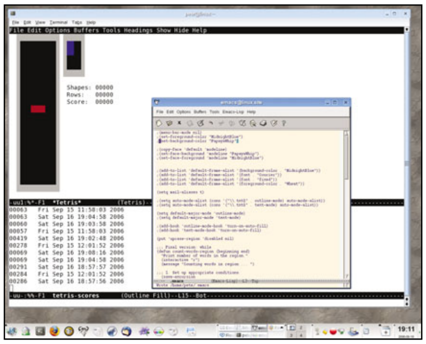


Fig. 2. Emacs looks and works mostly the same whether run as an X-window application or from the shell command line: editing the .emacs file under X and playing Tetris in the shell.

Now type "ESC x insert-current-time ENTER" to insert the current time.

Another function I find indispensable is "word count," for counting words in an entire buffer or just a selected area of the buffer.

```
(defun recursive-count-words (region-
end)
    "Number of words between point
      and REGION-END."
  ;;; 1. do-again-test
    (if (and (< (point) region-end
      (re-search-forward "\\w+\\W*"
         region-end t))
  ;;; 2. then-part: the recursive call
    (1+ (recursive-count-words region-
end))
  ;;; 3. else-part
    0))

  ;;; Recursive version
  (defun count-words-region (beginning
end)
  "Print number of words in the region.
```

Words are defined as at least one word-constituent character followed by at least one character that is not a word-constituent. The buffer's syntax table determines which characters these are.

```
  (interactive "r")
  (message "Counting words in region ... ")
  (save-excursion
    (goto-char beginning)
    (let ((count (recursive-count-
    words end)))
      (cond ((zerop count)
        (message
        "The region does NOT
        have any words.")
        ((= 1 count)
        (message "The region has
        1 word."))
        (t
        (message
        "The region has %d words."
count))))))
```

Wrapping Up

There's much more to Emacs than meets the eye, and it's worth exploring to see what it can do for you. Whether you use it as a backup text processor for system emergencies or to get real work done as a programmer, writer, or Web developer, Emacs can't be beat. CPU

by Pete Loshin

Infinite Loop

Move Over, Rubber Ducky

For those of us who thought Mr. Quackers was the best thing to happen to baths since bubbles, there's a new form of bath-time entertainment on the market: glow in the dark bubble bath. Offering the soothing glow and honey-and-vanilla scent of your usual tubside candles—without the fire hazard—this stuff just might give Mr. Quackers some stiff competition in the race for bath-time bliss. ▲

Source: http://www.latestbuy.com.au/glow_bubble_bath.html

Shavings From The Rumour Mill

by Mike Magee

Consolidation Races On In PC Business

You do know I am very ancient, don't you? The picture on the right shows I wasn't born yesterday. I shudder to look at it, really. Must go check out how that portrait of me as a young man is looking in the attic.

At least for the last five years, people have said the Taiwanese IT business has to consolidate, but it's only this year that we've seen firm signs that's actually happening now.

Last year, Nvidia bought chipset maker ULI. This year we've seen ECS snap up Uniwill, Flextronics buy server board firm Iwill, and motherboard giants Asus and Gigabyte team up in a joint venture. More recently, it's been rumored that Asus wants XFX, a report that's been officially denied. Nvidia has been in talks with Via but it seems those conversations stalled. The mummy and daddy of all consolidations this year is, of course, AMD buying ATI. What's going on?

The fact is there's not that much profit to be made in the hardware business these days unless you're one of the giants. ULI's former CEO told me a year back that the chipset business was becoming more and more difficult to sustain. This year, ATI CEO Dave Orton told me there would only be three chipset companies around in a few years' time. A very senior exec at Biostar who I won't name here told me at Computex this year that the motherboard business had ceased to be the cash cow it once was. It's becoming harder to brand motherboards in a different way—they're turning into commodities.

It won't just be at the component level that we can expect consolidation. While there are many flat-panel LCD manufacturers around, there are even more suppliers of finished products. There are already signs of consolidation at the manufacturing level; investment in next-generation fabs for LCD panels is a capital-intensive business, profits are slim, and there are too many players in the market.

I've already written in one of my columns for *CPU* magazine that choice of notebooks is also constrained by the fact that there are a handful of manufacturers, such as Quanta and Wistron, who churn out the vast majority of notebooks for the world market. They might have different stickers on them, but they all come from the same stable.

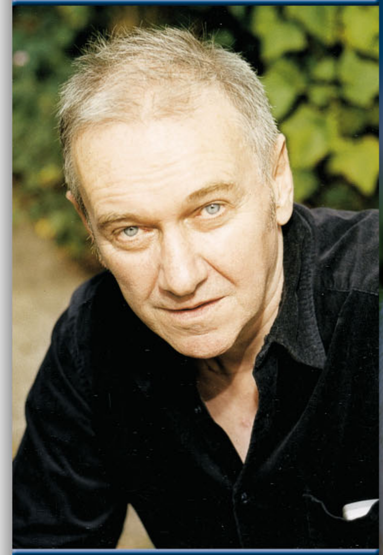
It's not just the hardware side of the PC business that's becoming tough, either. I have just returned from a week spent in Bangalore, India, and the amount of software development going on there is simply staggering. On a tour of the high-tech area, I must have counted nearly 100 high-tech developments under construction. The big names have already been there for quite some time—IBM, Microsoft, Intel, AMD, and all the rest.

A sort of inverse Moore's Law is at work here. While a notebook manufacturer is under pressure to produce machines for the multinationals like Dell at the lowest cost possible, that forces the suppliers to cut costs from their own suppliers and to keep head counts down to the minimum. Labour is still cheap in India and China. So the software firms hire engineers in India, while the hardware manufacturers continue to outsource as much building as they can to China.

Where it's all going to end, no one seems very sure. There is a limit to how much you can cut your costs and still produce high-quality products. Some have speculated that the notorious battery recalls from Dell and Apple earlier this year are down to Sony trimming costs to match bill of material lists provided by the vendors. Low-quality components are hidden inside the case; you can never be entirely sure with any bought PC what the quality of the individual parts will be.

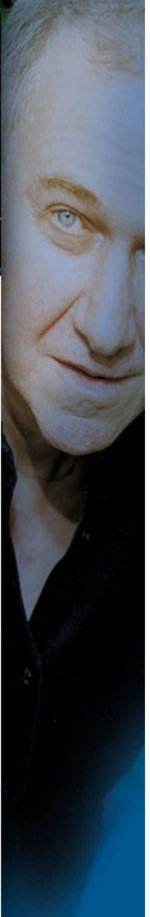
We have the option to influence PC manufacturers by insisting on well-made notebook and desktop machines with high build qualities. Perhaps we may have to pay a little more for this, but you get what you pay for. The PC vendors and components firms have an obligation to offer good-looking, fast machines with reliable parts. And if that sounds like old-fashioned talk from an old fogey, well there's nothing wrong with that. ▲

Send rumours to "Mad Mike" Magee at mike@cpumag.com.



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

The fact is there's not that much profit to be made in the hardware business these days unless you're one of the giants.



Kentsfield Rocks The House

by Rahul Sood

Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple //c and painted it red before turning it on. His parent's dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

Many weeks ago our FedEx driver arrived with a surprise: Intel had shipped us a few Kentsfield CPUs. The minute they arrived, we quickly put together some bench configurations to test the processors capabilities. Assembly went off without a hitch; it was effortless to put the configurations together and get them to post. We installed our standard 650-watt power supply, a Voodoo heatsink, some Corsair memory, and a pair of ATI Radeon X1900XTX cards in Crossfire. It wasn't until we started to load test our samples that we thought there was something wrong with the CPUs.

To give you an idea of what we witnessed, you must understand that our techs test hardware using some of the most rigorous methods in the industry. We normally start by softwaring the machine from scratch, followed by a custom benchmark suite called Haiti. Haiti was designed to bring any and all hardware to its knees as it continuously executes multiple games and benchmarks with escalating demands. Our Kentsfield platforms didn't seem to have a problem running through the suite over a 24-hour period. This is standard procedure for us in our final testing prior to shipping a machine. If our systems do not pass a full run of Haiti, we will not ship the machine to a customer.

I then asked the team to kick it up a notch and do whatever they could to sweat the hardware. I knew that if we killed a CPU it wasn't a big deal as we were working with engineering samples—it's always important to understand the limitations.

Our lead tech on the project decided to run a torture test consisting of four instances of Prime95 while running Far Cry in a looping "max settings" demo. Still no trouble, so he ran four instances of Prime95 while viewing a DVD with multiple applications sitting idle in the background to eat memory. The system still had 10% of its CPU resources left to spare. To put this in perspective, usually two instances of Prime will cripple any dual-core CPU at any level of performance. Not only did this machine run through the most intense benchmark without breaking a sweat, it blew away our expectations with the DVD test.

To make things interesting, I had the tech remove the fan from the CPU and leave the heatsink on. Under normal tasks everything seemed OK and the temperature hardly increased. This is where I thought for sure something was wrong with the hardware (because most systems would have crashed by now), but further tests proved that the CPU was running at full throttle the entire time.

After about 30 minutes of tinkering, the system *finally* tapped out. To ensure that the hardware wasn't to blame for the odd no-fan behavior, we attempted the same thing on the other configurations—all of them yielded more or less the same results.

There is clearly something amazing about this processor; it is easily my most-wanted CPU for 2006. Not only does this machine run cooler than the AMD Athlon FX or Core 2 Duo Extreme, but it seems to run more applications at one time without breaking a sweat.

We all know AMD has some strength where multitasking is concerned, thanks in large part to its chips' integrated memory controllers, but Kentsfield has raised the bar. In fact, after the initial tests we ran I would say that architectural differences won't matter when Kentsfield comes to town—the proof will be in the benchmarks.

Now imagine the possibilities with an advanced liquid cooling system, some high-end memory, a top-shelf motherboard, and a bit of overclocking. Granted, our chips were engineering samples so the production modules may yield different results, but from what we've seen so far in our labs I think it's safe to say that Kentsfield is a killer processor. We are certain that most of our high-end OMEN machines will ship with it.

Intel has done well, again; it's time to give the Israeli engineers a raise, man! ▲

> . . . usually two instances of Prime will cripple any dual-core CPU at any level of performance.

Send your opinions to this opinionated guy at rahul@cpumag.com.

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53992	$ 54.95

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- 256MB USB 2.0

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SDCZ2-512-A10	$29.95
SDCZ2-256-A10	$19.95
SDCZ2-128-A10	$14.95

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KF128LCSWM	$14.95

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SDMSV-2048-A10	$129.95
SDMSV-1024-A10	$89.95
SDMSV-512-A10	$59.95

Memory Stick SAVE!
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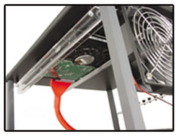

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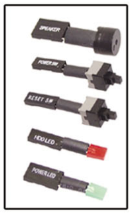

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Technically Speaking

An Interview With John Siedlarz, CEO Of The National Biometric Security Project

John Siedlarz is the former chairman of the IBIA (International Biometrics Industries Association), and former president and CEO of IriScan (now Iridian Technologies). Currently he serves as chairman and CEO of the NBSP (National Biometric Security Project), which recently published the first volume of its BTAM (Biometric Technology Application Manual).

by Barry Brenesal

CPU: Let's start with a basic definition of biometrics.

Siedlarz: Virtually every human feature that can be reduced to a code and stored in a computer, then recalled on presentation, can be classified as a biometric. However, those that operate at very high speeds and are capable of making and reporting on a match in real time—as opposed to those that require a significant amount of manual intervention—are typically what we think of when we describe a technology as being a biometric.

CPU: What are the major divisions of biometrics?

Siedlarz: I'd like to make it clear first of all that the technology today has matured to the point that we're no longer talking about research. We're talking about field application, and the more prominent technologies include iris recognition, handwriting analysis, voice recognition, fingerprint identification, facial recognition, epithelial tissue identification, hand geometry, and, to a lesser degree, vein patterns. There are others that fall into behavioral categories, like keystroke dynamics and even gait. These have some established capabilities, but they aren't in common use.

CPU: As most of those are well known, can you describe keystroke and gait?

Siedlarz: Keystroke is the pattern that a human being has when they use a keyboard. There's a unique quality to that; certainly not to the same extent that one finds in iris recognition or fingerprints, but still enough to merit use. Gait is the way an individual walks, and the pattern discernable over a period over time. Other technologies that might someday fall into the category of biometrics, like DNA, are not quite there yet.

CPU: How long has biometrics been around as a viable field of security technologies?

Siedlarz: We could take it back hundreds of years, but in reality the automated versions of biometrics have probably been around for not more than 40 years. I got my first exposure to them on a personal basis just about 34 years ago. At the time I was an Air Force officer, and my position was chief of the Systems and Equipment branch for the Air Force Office of Security Police. In that capacity, I had an opportunity to look at advanced technologies for possible application in security environments, and biometrics was one of the new ones that came along: not good enough to use under the heavy 24/7 requirements that we had at the time, but interesting nevertheless.

CPU: What drove the development of biometrics over time?

Siedlarz: The perceived need for a better identifier has been around forever. Our ability to identify human beings has traditionally been very poor and relies on judgment, along with not very thorough or very automated analysis. So the ability to automate that function to relieve humans of at least the basic level of decision making has been a goal for many years, both in criminalistics, in terms of identification of perpetrators, and everyday transactions, in terms of our ability to ensure that people are who they say they are.

But what really drove the development of biometrics has been computers. Before I got involved in the IBIA, and now the National Biometric Security Project, I was a vendor. I helped to introduce iris recognition as a business in 1993 and served as head of that company for seven years. I can tell you that the advances in computers were hard for us to keep up with. We would build a system to work with an early version of a machine, perhaps a Pentium I or earlier still, and before we could get it into the field, the computer industry was producing faster models. Computer development is making it easier to use biometrics systems, even the more sophisticated ones that perform in what we call the 1-to-n environment—where they can go into millions of templates and make comparisons at very high speeds.

CPU: You make it sound as though a modern, fast Pentium would enable you to get into some pretty intensive number-crunching.

Siedlarz: No question. Nor is it a question of any of the technologies demanding a specialized computer or processing platform to support biometric data.

CPU: What computer systems are you currently using, both to maintain a database, and provide functionality for analysis tools?

Siedlarz: Essentially commercial-grade computers, Windows-based operating systems, and available database software from Microsoft.

CPU: With simple equipment like that, biometrics presumably should provide a greater deterrent to Web-based identity theft.

Siedlarz: Biometrics provides an opportunity to not only deter that theft by making it much more difficult to assume someone else's identity, but once it has happened, much easier to recover that identity and prove that you are who you say you are.

CPU: Perhaps that helps explain the way the use of biometrics has spread out among so many fields.

Siedlarz: Sure. If you just stop and make a list of any kind of transaction between humans that involves proof of identity or assuring someone who you are, it's almost endless. There are any number [of transactions] in the financial area, the business area in general, government interactions—anything from benefits eligibility, welfare payments, agency membership—it just keeps going on. Wherever there is a call for establishing a human identity, the ability to do it in an automated way that gives both parties a degree of confidence that they otherwise would not get from just looking at a face and making a guess, has to be valued.

CPU: What is the National Biometric Security Project?

Siedlarz: It really serves the government and the private sector in the civil infrastructure area. We're a nonprofit that was created after 9/11 to help in the acceleration of biometrics and deter terrorism. So our market is pretty broad. It's working with those companies that have a responsibility in that sector, as well as with nonmilitary government agencies.

CPU: Are you any longer associated with iris recognition?

Siedlarz: Not any longer. When I walked away in a change of management six years ago, I deliberately took on a neutral stance among biometric types. I have great faith in the iris technology, and it's clearly one of the leading biometrics in terms of performance and accuracy. But there are some applications where iris recognition is not the best choice.

CPU: Can you provide a couple of examples?

Siedlarz: You have to capture the biometric feature. If you have a situation where you can't get a clear picture or the individual is not cooperative, then iris recognition is going to find it difficult to be successful. Whereas with facial recognition biometrics, it's fairly easy to accomplish your goal. It's also true, for example, because of the criminalistics link, that we don't leave a lot of latent iris prints lying around. But fingerprints, of course, do.

CPU: Can you provide a few instances of interesting applications of biometrics today?

Siedlarz: Concerning the border security issue: Iris recognition has been used in Dubai very effectively over the last few years. Everyone who enters or leaves is recorded. If it's decided Dubai does not want them to return for any reason when they go through the system again, they're kept out. And on the Afghan/Pakistani border, the United Nations has been using biometrics for confirmation of refugee

> But I think all new technologies still require a warning that says, 'Hey, we're still made by human beings, and because we are, we still may have imperfections.'
> —John Siedlarz

status. So you don't have a situation where a refugee gets benefits, then crosses back over the border again and returns as someone else to get still more benefits.

On the ridiculous end of the scale, an individual bought a biometric system—it happened to be iris recognition—to protect access to his cigar humidor.

But that's just two examples, leaving aside the sillier one. Biometrics are being used very effectively in correction facilities, in airports—for flight registration. More and more countries are doing this.

CPU: I think Canada has started, recently.

Siedlarz: Yes, and the UK has been using it for some time. In fact, in the UK there's been some wavering on that issue and discussion of employing a national ID card that uses biometrics.

I've always been struck by the unreasonable expectations that burden a new technology and its application.
—John Siedlarz

CPU: There is a lot of public concern about the card infringing upon personal privacy. What's your view of that?

Siedlarz: We all walk around with driver's licenses that contain various tidbits of personal information. Many states are beginning to adopt the use of biometrics. When I was in the military for 20 years, I carried an ID card, in addition to a driver's license—neither of which I felt at any point was an invasion of privacy. On the contrary, I felt it gave me a degree of protection in terms of establishing on a firmer basis who I really was when there was some issue involving that.

CPU: Have you ever been put in a situation where you've had to tell a vendor that you felt biometrics as they wished to apply it might be going over that privacy line?

Siedlarz: Not yet. I won't deny it's possible. But we take the position that the biometric data itself—the template, which isn't the computerized image, but is the encoded result of the image—isn't personal data. To me, it's less than the equivalent of walking down the street and being able to see everybody's face in public. There's no way if you have access to that template that you can reconstruct the image.

There are a couple of things that are operative, here. I think that if there's backroom activity going on, like data mining as a result of using biometrics through, for example, an ID card, that activity may be really reprehensible. But I don't think that attacks all of the pieces of the technology that are used to get there. It just means somebody is abusing that information.

CPU: We've discussed how computers have driven biometrics by providing so much more in the way of processing power. What are some of the computer-based biometric developments that you think might occur in the near future that haven't quite been realized yet?

Siedlarz: One of those that has been a dream for years is the equivalent of the universal reader. It is a device that we could plug into a computer through a common USB port that is capable of accepting virtually any biometric—finger, face, iris, anything. I think we're getting closer to that. After all, years ago when we spoke of using iris recognition on the street, all the talk was about developing cameras that were sophisticated enough to capture the image and send it somewhere. Just two weeks ago I went out and enrolled in a new cell phone program and picked up a cell phone that was capable of doing that. It had the kind of camera capability that we were struggling to achieve seven or eight years ago. So in the biometric-related area of video, to crunch numbers, to store data, and to move it quickly by secure means, the advances over the last 10 years have been nothing less than incredible.

That said, I've always been struck by the unreasonable expectations that burden a new technology and its appli-cation. If we're running an entry point—access to a big building, say, Exxon-Mobil headquarters in New York—and it's being manually controlled by cards, then there's a proposal to switch to a system that relies on biometrics to make that decision. It's amazing how administrators in particular look to making a demand on the new system in a capacity close to if not at 100% of effectiveness when in fact the system that they've been using for the last 15 or 20 years may have been 30% effective. It's just a marvel to see expectations taken to the extreme. You've got to give a new technology a chance. We seem to be a lot more forgiving about the development of computer technology over the last 35 years than in anything involving security.

CPU: Biometrics, though, is the Flash Gordon of security. It creates the impression in people's minds that you're right at the cutting technical edge and you can do anything.

Siedlarz: There's a lot of truth in that. But I think all new technologies still require a warning that says, 'Hey, we're still made by human beings, and because we are, we still may have imperfections.' CPU

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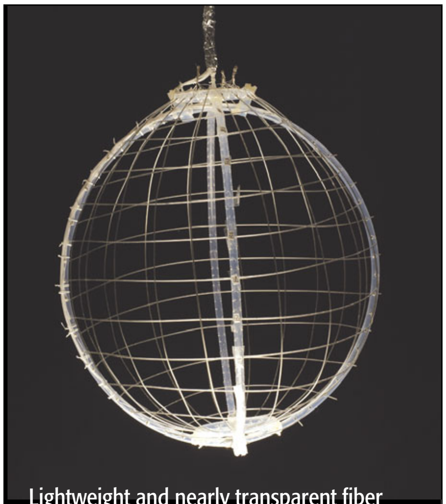


Lightweight and nearly transparent fiber webs may one day allow optical sensing without lenses or detector arrays.

Imagine being able to communicate with your computer by touching the screen with a beam of ordinary light or wearing clothing that can sense your environment, giving you the ability to "see" behind you. These are just a couple of possible applications of a new optical sensing system developed at MIT.

A team led by Engineering Professor Yoel Fink has developed a nearly transparent, light-sensitive fiber that, when arranged with other fibers in a closed spherical web, is capable of measuring the direction, intensity, and phase of light. This creates an optical system that could one day provide an unlimited field of view without relying on lenses and a detector surface to see images.

An individual sensing fiber is about 1mm in diameter and consists of a photoconductive glass core with electrodes running its length and a transparent, protective polymer surrounds the core. When light touches the fiber, it registers by producing a change in electrical current. Although one fiber alone cannot determine the direction from which the light is coming, when arranged in a sphere, multiple fibers detect the light passing through as it enters and exits, pinpointing the exact location of the light source.

The scientists also created a flat, 2D web of the fibers and stacked them on top of one another. In this configuration, the fibers were able to convey a simple, blurry, illuminated image to an attached computer. The system's software, taking on the role that a lens plays in traditional optics, then "focused" the image by tracing the light back to its source and reconstructing a sharper version of the original.

Fabien Sorin, an MIT graduate student and co-author of the team's findings, believes that straightforward applications of the technology, such as a light-interactive screen that could be used for presentations or in gaming systems, could appear on the market in as little as two years. But, given the ease of production and low cost of the fiber, other applications also excite him.

"Maybe the most intriguing [possibility], although technologically challenging, would be to have fibers that not only see, but also generate electricity upon illumination, says Sorin. "In other words, create ultra low cost photovoltaic fiber webs. The ratio of the efficiency of a single fiber with the cost of the area covered by these fibers could compete significantly with the current solar cell technology." ▲

Computer Program Paints A Thousand Moods

When you're feeling happy, the last thing you want is depressing artwork harshing your mellow. What if the images on your walls could adapt to your emotions, reinforcing your sunny moods with bright color and helping you spiral down even farther with dark colors for those depressive days?

Okay, this scenario isn't *exactly* what the creators of the empathic painting program had in mind, but they have created a tool that lets artists add an element of emotion to their work, simply by letting their feelings show on their faces.

"The empathic painting is really an experiment into the feasibility of using high-level control parameters, such as emotional state, to replace the many low-level tools that users currently have at their disposal to affect the output of artistic rendering," says Dr. John Collomosse of the University of Bath's Department of Computer Science in a recent press release.

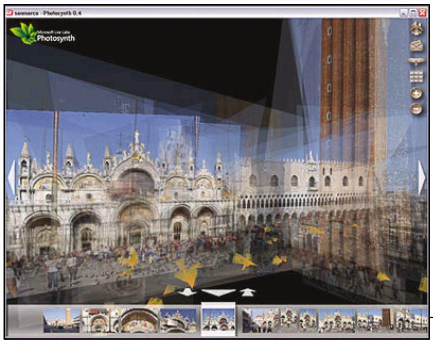
Collomosse developed the program in collaboration with colleagues Maria Shugrina and Margrit Betke at Boston University.

The software uses a simple Web cam to capture facial expressions and determines a user's mood by analyzing eight key facial features, including mouth shape, eye width, and brow position. It then applies different colors and brushstrokes to digital artworks, attempting to match the viewer's perceived mood—reddish hues with sharper brushstrokes for anger, blues and greens with smooth strokes for sadness, and brighter colors with flowing strokes for happiness. A neutral mood produces an image that is very close to the original work.

The program processes the emotional analysis and makes changes to the art in real time at about 4fps, so that once the system is calibrated, a user can immediately see how his emotions impact the scene. ▲

3D Photo Album

It used to be that no vacation was complete without a living room slideshow to share snapshots of the cool sights. In the Internet age, people share photos on a much larger scale with sites such as Flickr. Now, it's possible to view not only your own shots of the Grand Canyon, but also millions of others' photos.



Photosynth provides a novel 3-D platform to organize and browse a collection of photos.

Enter Photosynth, a Web-based tool that will let users bypass the blasé slideshow and browse a photo collection of a location or scene in 3D. A partnership of Microsoft Research's Richard Szeliski and University of Washington researchers Noah Snavely and Steven Seitz is developing the system.

Photosynth works by analyzing photos of a scene to find common distinctive features, such as architectural or landscape details, and linking those features and photos together. It applies algorithms that determine the location where an individual took each photograph. The algorithms base the location on the relationships between the photos and on absolute data such as focal length and retrieved GPS information embedded in the EXIF tags from some of the images.

The browser then creates a 3D image-based model that presents a nonphotorealistic overview of the scene, showing the location from which each photo in the collection was taken. When a user chooses which viewpoint of the scene he would like to see, the browser smoothly "flies" to that position and presents the specific image in the collection that corresponds with the vantage point from which the photographer snapped the image.

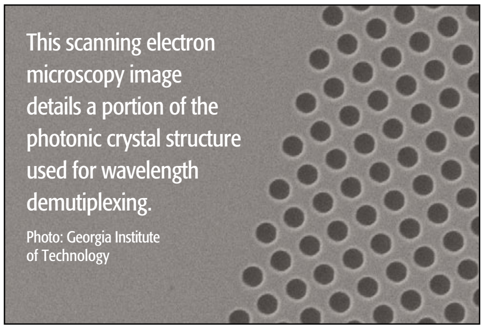
Tools let the user move around the scene, with each photo morphing into the next, "zoom in" on a highlighted area to view a more detailed photo, or view all photos in the collection taken from the same location. Users can also annotate photo details and link them to other forms of media such as Web sites and audio and video clips.

The research team is currently working to reduce the long processing time that the system requires for image point matching of large photo sets. "We're investigating a variety of options for users to author and create their own collections but we do not have a definitive time frame for this functionality yet," says Microsoft Live Labs Group Manager Alan Sheppard.

But in the meantime, he continues, "users will be able to browse some compelling selected collections this fall and experience the user interface for themselves firsthand." ▲

Shrinking Sensors

Integrating sensing optics and communications technologies into a single chip isn't simply a matter of making smaller components. In order to fit as many processes as possible on a chip, researchers must combine different wavelengths of light; each wavelength carries different information. The key to sorting out and separating all these wavelengths to correctly process the information is called a wavelength-demultiplexer, or WD.



This scanning electron microscopy image details a portion of the photonic crystal structure used for wavelength demutiplexing.

Photo: Georgia Institute of Technology

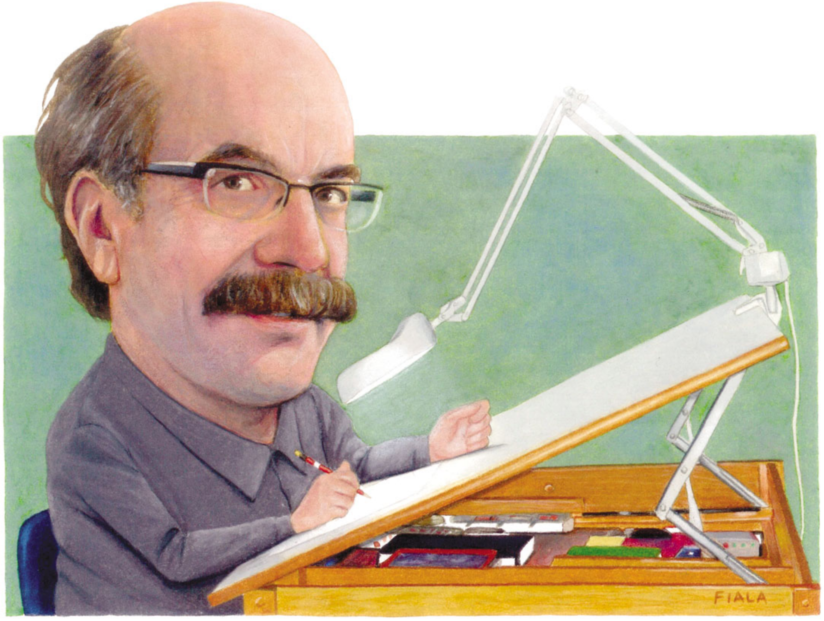
Researchers at the Georgia Institute of Technology recently developed a new WD that measures less than 100 microns across, significantly smaller than currently available WDs measuring several centimeters on a side. This compact WD advances the possibilities for integrating multiple functions on a chip such as signal processing, communications, or sensing, including sensors and "lab-on-a-chip" biosensor applications.

Electrical and Computer Engingeering Professor Ali Adibi lead the research team that achieved this size breakthrough by modifying the design of photonic crystals, combining three properties of the crystals into one by etching holes in an array on the silicon layer. This modification let the WD simultaneously separate wavelengths, focus them into different locations, and filter the unwanted wavelengths, all in a very small space.

The most exciting thing about the new research, says Adibi, is "bringing the power of spectroscopy and wavelength demuliplexing to a chip-scale structure that is less than 100 microns on a side by using the unique ability to engineer the dispersive properties of an optical material by simply modifying the geometry of a series of air holes." Adibi added the modified photonic crystals are no more difficult to manufacture than conventional crystals.

Possible future avenues of Adibi's research include integrating the WD devices with sources and detectors to demonstrate true lab-on-a-chip sensors and extending the results to 3D photonic crystal structures. He expects that photonic crystal WD devices and spectrometers could be in the market in three to five years. ▲

Q&A With David Kelley



David Kelley knows a good design when he sees it. Kelley looks at the effect that products have on people for his answer. Do they frustrate them? Bad design. Do they produce the experience the product maker intended? Good design. As founder of industrial design firm Ideo, Kelley and his teams helped create Apple's first mouse, Crest's toothpaste tubes that stand upright, and the Palm V PDA. He's also head of the design school at Stanford University where he has encouraged a multidisciplinary approach to design of products that includes the collaboration of psychologists, engineers, and even anthropologists. He wants "ambidextrous people" who can look at a design from multiple sides. Kelley has been preaching the importance of design for more than 28 years in the mechanical engineering department at Stanford. Now the 55-year-old is hoping to transform a lot more than products as director of the d.school (a $35 million school of design Stanford's building). With all of his experience, Kelley has a good handle on how to design high-tech products.

Q How would you design a personal computer today?

DK There are plenty of PCs on the market; you could just go out and buy a Dell. In order to enter that market, however, you want to come out with something that is novel in some way—otherwise it won't sell. So my definition of novel is it is a lot faster than everyone else's. I wouldn't be the one to do that. My approach would be to go out and study PC users and see what they need.

Q Do you think computers have become easier to use?

DK They have become incredibly easy to use, but the complexity is going up at the same time—if you go back to spreadsheet and word processor and that kind of stuff. Integration with the telephone, it's really good. The problem is the functionality has increased faster than the rate of making it easier.

Q How do you design products for both the enthusiast and the mass market?

DK In the same way: You talk to an expert user and you talk to a naïve user. Use the smartness of the technology that the computer fails to. When you come up to it, it assumes a naïve user. [For instance,] you walk up to a complex phone and it looks like a regular phone; the expert knows how to get it in the expert mode.

Q What is bad design?

DK It is when the person gets frustrated or feels bad about himself when using it. I gave the example of gas stations where you add your ZIP code. They would do it and nothing would happen; some left without getting gas. You have to do the ZIP and then push Enter. It didn't say that on the interface: That's a really bad design.

Q What is a good design?

DK It fits within the person's life. They do things the way they would normally do them. They get to do exactly what they want to do. It's not asking them to do things they don't want to do. What's the behavior that the design causes? Does it make them happy?

Q How has Apple influenced design?

DK All of us who have worked for Steve Jobs in a major part of our careers know that Apple is about doing it to the hilt. Steve Jobs wants everything done to the hilt. If you design at Apple, you get to do your best work. Apple has led the way. It's like someone who cares vs. someone who doesn't care. They are the rabbit leading the race, and everything gets better because of their example.

Q What is your hope for design in the future?

DK This designer stuff is so important to me. Other people understand it and use it in their lives. Designers have had this special creativity that is God-given. My dream is other people will adopt our methodologies and improve their products and experiences and lives. It's a lofty goal. ▲

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